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DISEASES OF THE NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

A Symposium on the Practical Value of Psychiatric Research

presented at a joint meeting of

Massachusetts Society for Research in Psychiatry and Trustees of Massachusetts State Mental Hospitals

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DISEASES of the NERVOUS SYSTEM

(PUBLISHED MONTHLY)

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

Introductory Remarks*

There is, I suggest, a significance to be noted in the fact that the scientific papers herein published were presented at a meeting in which the members of our research society were joined by our hospital trustees. The trustees form our link with the public which we serve.

As men of science, we have long been aware of the pleasures of academic superiority. We are becoming more perceptive, these days, of its consequential disadvantages. More and more, we have come to learn, the successful ivory tower is the one with its foundations in the market place.

Scientists, even psychiatrists, must earn a living. The day of the rich patron is long since gone. The patrons of today's research are corporate industry, responsive to the profit motive and therefore to public judgment of its product; the endowed university, dependent for its financial security on public acquiescence to its tax-free status; the research foundation, established by testamentary or trust gift, dependent for its continued existence on public approval expressed in tax law; and government itself, directly subject to popular will.

Need alone, in this complex period which some soberly call the atomic age, will not mother the inventions of research. We must have minds prepared to undertake research. The preparation of such minds in the basic disciplines, and the support of the research effort itself, are dependent ultimately on the public will. Certainly this is true in our democracy in 1947.

Given adequate information, the public will can move great obstacles to progress. The war provided an enduring example. The slogan of the Army's supply services—"The difficult we do immediately; the impossible takes a little longer"—was not an idle boast of a "brass hat." It was a reflection of the Army estimate of the American will to get on with any accepted task, including the transformation of the great industrial potential into the greatest military might.

The need for investigative work in neuro-psychiatry is obvious to those of us who work in the field. It is therefore easy to assume that it should be obvious to anyone, in view of the over-crowded mental hospitals, the increase of crime and delinquency, pathological social conditions in general, and the great miserable unrest which infects our people and the world. This assumption is indicative of the error of academic superiority. For the need is obvious to the public only to the extent that it connects psychiatric research, of which it knows little or nothing, with the obviously undesirable social phenomena, which it deplores. Without the linking of the two in the public mind, the phrase "psychiatric research" will merely bring to the minds of many the conventional comic picture of an odd sort of fellow puttering aimlessly in a cluttered laboratory.

It is not enough to blame the research worker for failing to explain to the public the practical implications of his work. It is not helpful to condemn the public for lack of interest. The imperative is that each of us regard as a personal responsibility the creation of public understanding of the cause-effect relationship between research and beneficial medical progress.

Our joint meeting was a step in discharge of this responsibility, in that the trustees are representatives of the public. The publication of these papers is another step. We can hope for even wider dissemination of this information among the medical profession generally and among the public.

But hope without works is not enough. To spread enlightenment, after all, is not essentially repugnant to the scientific mind. Let us then match our hope for a sympathetic public with work to win the understanding from which public cooperation and support will naturally follow.

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Commissioner,

Dept. of Mental Health,
Commonwealth of Massachusetts

*The papers in this Symposium were read at a joint meeting of the Massachusetts Society for Research in Psychiatry and Trustees of Massachusetts State Mental Hospitals held at Metropolitan State Hospital, Waltham, Massachusetts, October 28th, 1946.

The Need for Research in Mental Disease

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The first world war called to the attention of American citizens the magnitude of the mental disease problem. The second world war emphasized the problem. A brief review of the facts may help in the present discussion.

Approximately 1,750,000 citizens of the United States, between the ages of 18 and 37, were rejected by induction boards because of neurophychiatric disabilities during this last war. Approximately a million men who passed the physical requirements and entered the armed forces required admission to military hospitals during the progress of the war because of neuropsychiatric conditions, and of this number 475,000 had to be discharged, largely because of their mental disturbances. While accurate statistics are not available, it has been stated that, "at least two million persons in the United States are mentally ill, and as many as ten million will probably need hospitalization for mental illness for some period in the course of their lifetime."[1]

Nearly half of all hospital beds in the United States are occupied by victims of mental illness. Many mental illnesses tend to be chronic, and although about 600,000 beds are required for mental patients only about 100,000 new cases each year require hospital care. The life expectancy of United States citizens has increased substantially, and a definite upward trend of hospitalization of mental illness in the aged group is apparent which will tend to increase further the hospitalization problem.

There is even a larger number of people than those hospitalized for mental illness who, while not definitely psychotic, suffer from mental reactions which detract from their otherwise normal existence. Many should be hospitalized. Many of those in hospitals, had they received proper early treatment, might have avoided hospitalization.

Such matters as delinquency, suicide, homicide, and alcoholism all have psychiatric components which would profit by more vigorous attention than has been possible in the past. The existing inadequacy of personnel services and of facilities to properly handle this vast public health problem is familiar to all who have any interest in the matter.

The distribution of trained psychiatrists is uneven in relationship to population, these specialists tending to gravitate to the large cities, and their numbers are inadequate, there being only about 4,000 experienced psychiatrists in the entire country. Less than one fifth of the clinics necessary for adequate case finding and early diagnosis of psychiatric disorders are available, and these likewise are concentrated in the larger cities.

It should be noted that there will be approximately twenty million veterans eligible for care in Veterans Hospitals, representing roughly one seventh of the total population. The veteran generally is to be cared for under the best possible conditions, largely in newly constructed hospitals and in newly established clinics, the trained personnel to be drawn chiefly from the ranks of civilian and state hospital psychiatrists, and other technically trained workers. On the other hand, the Veteran's father, mother, sister, and brother, and other relatives who are not veterans and who, of course, represent a majority of the citizenry of the nation, must continue to be cared for by the State hospital system. A spokesman for the Veterans Administration recently stated that he was glad that they had raised the salaries of their employees to their present high levels and hoped that state hospitals could meet the Veterans Administration levels. He was regretful of the necessity of competing with the state hospital system. If the trained personnel capable of teaching is diverted from the group caring for the largest part of the case load, the need for compensatory

action to offset such diversion must be considered and appropriate action taken, if standards are to be maintained.

Approximately 98% of the hospitalized mentally ill are in tax supported governmental hospitals—and the state hospital bears the overwhelming bulk of the load. About 74,000 people were employed in mental hospitals in 1943 and the operating cost was about $138,500,000. New York State alone will spend in excess of $80,000,000 this year in new but chiefly replacement construction. This amount is for capital expenditures alone and does not include operating maintenance costs.

To meet prewar standards, 1,500 additional psychiatrists plus many times that number of other trained personnel are needed in state hospitals. It has been estimated that an additional 2,000 psychiatrists and many trained technical personnel are needed to staff out-patient, research and teaching institutions. The necessity for training general practitioners as a first line of psychiatric defense, as well as improving psychiatric under-graduate training, and improving psychiatric residencies to meet the for preventive work and research than is now true in the mental health field.

The important thing in research is personnel. It is obvious that we must "sell psychiatry" to the most talented researchers in the field of medicine and allied disciplines. We must provide these researchers with proper working and living conditions, security of tenure, adequate research facilities, adequate salaries, adequate assistants, both technical and clerical. To avoid duplication of effort, we must supply proper direction and coordination. We must provide, in short, the things that any man looks forward to—a decent living, education for his children, and opportunity for a fair amount of relaxation, a decent retirement allowance when that time arrives. When we find men who have the research gift, "germinal idea" men, men who are intelligent, who can see problems, who know how to observe, record their observations, experiment, formulate hypotheses, test their hypotheses, men who are intellectually honest, then we must do all in our power to encourage such men to do productive research.

In the past, the major sources of financial support for research in mental illness have been private foundations, special research funds of private hospitals, gifts from individual citizens for special research, from such organizations as the Masons, and from State subsidies. Much research has been done as a "labor of love" by men weighted down with large case loads, or with heavy administrative burdens.

The National Mental Health Act recently enacted is designed to improve mental health through authorizing the Public Health Service to conduct, to assist in conducting, and to promote the coordination of, research, investigations, experiments, and demonstrations relating to the cause, diagnosis, and treatment of psychiatric disorders, and through authorizing the Service to train personnel in matters relating to mental health and to develop, and assist states in the use of the most effective methods of prevention, diagnosis, and treatment of psychiatric disorders. Thus, we finally have the Federal Government recognizing standards of the American Psychiatric Association, should be apparent.

As workers in the field of mental disease, it is our responsibility to find ways of preventing mental illness, and of alleviating and curing the mentally ill. We must return our patients to normal health so that they can again become producers. The loss of productivity to the nation because of the mental illness of its citizens is conservatively estimated to be in excess of a billion dollars per year. What can be done to eradicate this national liability? The best answer is more and better research supplemented by more and better education in this field.

It has been estimated that not more than 2½ million dollars are spent annually on research in psychiatry and allied fields, as compared with a hundred times this amount for the maintenance of mental institutions.[2] From a historical point of view, advances in public health have been characterized by the expenditure of much more substantial sums the problem—about $3,000,000 per year will

be available for the state subsidy of training programs, education and research. Although the sum is small, it is a start.

Massachusetts for many years has been in the forefront of research leading to prevention and improved treatment of mental illness. Up to this time, the State has been reasonably generous in providing support for research. The question is left open as to whether research appropriations should be discussed on the basis of comparisons with other states, or whether support should be granted on the basis of suggested projects and other equally valid considerations. It is contended that it would be sound business policy for Massachusetts, as well as other states, to substantially increase expenditures for research on mental diseases. This statement applies with equal force to the Federal Government.

As taxpayers, we have a right to know how our tax money is being expended. From an economic standpoint, as already observed, mental disease is costly. We have noted the comparatively small amount of money available for research in mental illness. Without detracting from the merits of expenditures in research on poliomyelitis, we repeat the information offered by the proponents of the National Mental Health Bill, that the sum of $100 per case per year is spent on research for each victim of this disorder against 25 cents per case for victims of mental disorder. Numerically speaking, poliomyelitis is a rare disease in comparison with mental illness. Are state officials who control the purse strings properly informed as to the problem? Should we spend more money in an effort to slow up the ever increasing expenditures for mental illness, by research on methods of prevention and care, or shall we continue to contribute to an ever increasing burden of custodial care for the mentally ill?

To some people, research represents a waste of money, particularly if the subject dealt with is "pure research" as contrasted with "applied research." The desire of the monk, Mendel, for knowledge, pure and simple, led him to make his classic observations on the ordinary garden variety pea, which led to the establishment of the "Mendelian" principle of heredity. This is an example of "pure research." When the agriculturist uses these basic laws to develop a hardy strain of Northern wheat, which will in turn open up for development vast farming areas, we have an example of "applied research." Of course, we all like to see the immediate practical results of research in terms of immediate saving, as, for example, so frequently occurs following lobotomy in disturbed, destructive patients, and who often lose their destructive tendencies following the operation. However, it is often necessary to wait many years to see practical results of a given research.

Industry, of course, recognizes the value of research. Without research in the present highly competitive world, modern industries could not survive. This was a lesson taught us by the Germans who shortly following the Franco-Prussian war recognized the interdependence of "pure" and "applied" research, and organized their industries on that basis. Their great electrical and chemical industries established research laboratories for purposes of private gain. As a result of their research findings, the Germans early took the lead away from the Englishman, Perkin, who had established the synthetic dye industry, and at the same time sounded the death knell to the vegetable dye industry.

In the years preceding the war, the United States spent about 250 million dollars a year on research, and of this amount only about 10% was spent on "pure research." In 1940 organized industrial research employed about 60,000 scientific workers in more than 2,000 laboratories.[3]

How often the potential importance of so-called "pure research" is not visualized; however, history has conclusively shown that most of the practical applications of scientists have sprung from "pure" scientific curiosity, for example:—Clerk Maxwell enunciated the theory of electro magnetic waves in 1860. Hertz first detected them in 1887 and their use in radio was made finally possible by the practical inventions applied by Marconi. Langmuir's invention of the gas filled lamp, which probably saves

the United States a million dollars a night in its electric light bill; according to Langmuir, himself, "was nearly a direct result of experiment made solely for the purpose of studying atomic hydrogen, a purely theoretical problem."[4]

The present day tendency is for coordinated centralized research teams. There can be no doubt that cooperative research, using many specialized techniques at the same time, pooling resources—both equipment and brains—is one of the most effective methods of producing results. Without research on such problems as chemotherapeutic methods for the cure of malaria, the development of insecticides effective against disease bearing insects, the development and the utilization of the so-called "sulfa" drugs, the development of blood plasma, the commercial development of penicillin and its therapeutic uses, and many similar projects, World War II might still be in the combat stage.

In Massachusetts coordinated teams of researchers are working at the McLean Hospital, at the Boston and Worcester State Hospitals, at the Worcester Foundation for Experimental Biology. However, there is room for individual researchers, for some researchers are quite unable to work as a member of a team.

As the great researcher, Theobald Smith, said, "the older type of research involving observation and study of the entire fabric of diseases, largely with the help of the unaided senses such as was the practice of the doctors a century ago, has had its day, but backed by experience and a keen, observant mind, it even now occasionally triumphs over the narrow controlled research of the laboratory."[5] Perhaps one of the greatest physicians who ever lived, Sir James MacKenzie,[6] once wrote—"About 1883 or 1884, I resolved to begin a series of careful observations entirely for my own improvement, never dreaming of research, for I was under the prevalent belief that medical research could only be undertaken in a laboratory, or, at least, in a hospital with all the appurtenances; I merely sought to find out something about the patient's complaint." One day he discovered a simple yet significant truth:[7] the only way to find out what a symptom betokened was to wait and see what happens to the person with the symptom. MacKenzie set himself two definite research objectives: 1. Understanding the mechanism of symptoms, and 2. understanding their prognostic significance. As a result of his findings in this entirely clinical type of research, he became the outstanding heart specialist in the world. Emil Kraepelin was the greatest exponent of clinical research in psychiatry up to the time of Freud. Kraepelin's remains the basic mental disease classification in use today, and his prognostic work is still relatively satisfactory. Freud gave us the most profound psychological understanding of the working of the mind. We need much more good clinical research. The field is far from exhausted.

Although great discoveries are sometimes made by accident, by far the majority of basic discoveries come as the result of the cumulative efforts of scientists, often extending over centuries. The so-called insulin shock treatment is perhaps the most successful in the treatment of dementia praecox. For purposes of illustration, I should like to outline briefly the history of the development of insulin, using MacLeod largely as the source of information.[8] The first step of the cumulative research which lead to the discovery of insulin was taken in 1683 when Conrad von Brunner noted that removal of the pancreas in a dog was followed by symptoms, which, from his description of them, would now appear to have been those of diabetes. Brunner did not recognize the significance of his discovery, as he was merely trying to show by the survival of the animals, that the secretion of pancreatic juice in the intestine was not an essential factor of digestion. The Englishman, Cowley, in 1788 was the first to suggest the relationship between the pancreas and diabetes. Other investigators suspected the same relationship, and experimentally tried to determine whether destruction or removal of the pancreas from animals would make them diabetic. It was not until 1889 that Minkowski

and von Mering succeeded with such experiments by taking great care to see that the gland was completely extirpated. They suggested, contrary to Brunner's contention in 1683, that the pancreas must produce some internal secretion which served the function of controlling sugar metabolism in the body.

Langerhans, the anatomist, had earlier discovered in the pancreas an accumulation of cells which differed in their microscopic structure from those secreting the digestive juices. These are the so-called "Islands of Langerhans." The question arose as to whether the "Islands of Langerhans" might not have something to do with sugar metabolism. The anatomists, Laguesse and Diamare, were able to show that the island cells had a characteristic structure, that they had no ducts and, therefore, were endocrine glands. Also pathologists found that these islands were often affected in patients dying from diabetes. The British physiologist, Sharpey Schafer, suggested in 1916 that this hypothetical hormone be called "Insulin."

Many attempts were made by various investigators to prepare extracts of pancreas that would contain insulin. It was early sensed that one of the difficulties in achieving success in the production of insulin was because of strong digestive ferments, derived from the main secreting cells of the pancreas. A method had to be found by which the digestive cells of the pancreas could be eliminated without destroying the "Islands of Langerhans." It was discovered that this could be done by tying the ducts through which the pancreatic juice poured into the intestine. E. L. Scott in 1912 tried this method, but unfortunately did not obtain sufficient atrophy of the glands producing the digestive ferments. Zuelzer, as early as 1907, extracted the pancreas with acid alcohol in an effort to circumvent the action of the digestive ferments. His results were encouraging. The symptoms of diabetes were relieved, and excretion of ketone bodies and sugar in the urine became less or disappeared. However, some of the patients developed obscure symptoms of an alarming nature which made further trials dangerous and were, therefore, discontinued. Zuelzer would have had the problem practically solved in 1908 had he paid closer attention to the effects of the extracts on laboratory animals prior to using them on humans, as has been noted by MeLeod.

In 1921 Dr. F. G. Banting, in collaboration with C. H. Best, a medical student, reinvestigated the problem by using extracts of atrophied pancreas. They also prepared extracts from embryonic calves' pancreas. The extracts were passed through Berkfeldt filters, to remove bacteria, and were used on diabetic patients. It was discovered that these extracts had to be further purified and Dr. J. B. Collip was soon able to remove the impurities which were causing irritation at the sites of injections of the original extracts. Insulin became a potent agent in the treatment of diabetes mellitus.

In 1927 Sakel tried insulin in the treatment of the withdrawal symptoms of drug addiction and later excited states. At first he gave small doses of insulin trying to avoid coma or convulsions. He noted, however, that psychotic symptoms were markedly improved when the patients did go into coma. From this point he deliberately inample—Pasteur's comment that "chance favors the prepared mind" was particularly applicable to the discovery of penicillin. Doctor Fleming, the discoverer of penicillin, was growing bacteria for certain researches and noted that mold was contaminating one of the plates on which he was growing the bacteria. For some reason he decided to let it remain instead of starting a fresh culture. The next day he noted that the area occupied by the bacteria was decreasing, that the mold area was increasing, and that finally the bacteria had vanished. Doctor Fleming promptly took up the study of the mold and its ability to destroy certain bacteria.[9] Alan Gregg's remark, "Nothing but active participation in securing data will furnish the research worker with familiarity with his material and thus the requsite criteria for its eventual interpretation. In the act of observation, the gifted investigator sees what other men have not seen, or cannot see, sometimes what he himself never expected,"[10] was particularly applicable to

Fleming's work. Dctor Fleming had a prepared mind and he made his own chance.

This in brief, was the way penicillin was discovered. It appears that it will be of great value in the treatment of early syphduced coma and thus the insulin shock treatment of mental illness came into being. He reported his results in schizophrenia in 1933. The treatment, I believe, was introduced into the United States by Dr. D. Ewen Cameron at Worchester State Hospital in 1936. New York and other places started using the treatment at about the same time.

The above lengthy illustration which is admittedly very sketchy may give some idea of the costliness in time, personnel, supplies and equipment before an approximation of truth is reached and actual utilitarian value is derived from research. In the case of insulin a period of nearly 300 years elapsed between the initial steps of the research and its actual consummation in a useful discovery applicable to the treatment of disease, and several more years elapsed before its value in the treatment of mental disease was discovered.

Not infrequently basic discoveries are made by accident, that of penicillin, for exilis which produces mental illness. The above sketchy illustrations were given merely to show how two important discoveries were made. Everyone cannot do research. It requires special workers with inquiring minds and many other special attributes.

We are in a constantly changing world. Advances are being made all the time in scientific methodologies. As a result of improvements in methods or in technical equipment, we are able to more closely approximate truth. There is nothing static about scientific research. Perhaps that is one reason why the term research is so appropriate. Few problems are ever finally settled. What was accepted as scientific truth a hundred years ago, is now in the light of present knowledge, shown to be false. Many problems need to be restudied, using present day research tools. The problem of mental illness is tremendously complicated. It may be that we should pay more attention to the notion of "plurality of causes."[11]

When we consider the tremendous number of variables which may be operative in producing a given mental disease, we are particularly impressed with the difficulties attendant on solving the problem. The solid discoveries which have been made and are being made in the field offers encouragement to men, who like these members of the Massachusetts Society of Research in Psychiatry, know the principles of research and are not easily discouraged. To this group, I urge the continuance of their researches in spite of discouragements; I wish them success.

Support of research, both pure and applied, and its important ally—education together with more widespread use of known successful treatment methods—offers the major hope for the solution of the problem of mental disease; for reducing economic waste engendered by such disease; for restoring millions to good mental health; and for the restoration of happiness to the relatives of the victims of mental illness. We should all give our best efforts to the support of research in this field.

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Scientific Capital and the Dividends of Applied Science

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About a century and a quarter ago that gifted Irishman, Michael Faraday, observed that when an electric current passes along a wire near a magnet forces act on the wire causing it to move. Conversely when a wire is moved near a magnet electricity flows in the wire. In Faraday's time none of these effects were at all spectacular, since at best only weak currents could be generated from crude stacks of metal discs and the effects were difficult to measure. Nothing of the slightest practical importance was then known about electricity. It is said that one day the British Prime Minister visited Faraday in his laboratory and asked him why he, an intelligent man, spent his time on such trivial things. The thought that the tax payers' money might be used to finance such work was, of course, too absurd even to be considered. Faraday is said to have replied, "Sir, some day you can tax these trivial things."

It is a fact that today every electric motor utilizes directly the results of Faraday's discoveries. Every electric power plant installation is a direct application. Edison's electric lights would never have illuminated the world without Faraday's laws of electromagnetic induction. The taxes collected on the electrical power industries are bigger than the entire British budget of the year when these pioneer experiments were carried out. However, the story of Faraday's conversation with the prime minister is probably apocryphal since there is little reason to believe that Faraday himself saw the vast future of his work. He was certainly not motivated by dreams of its application to industry. He was simply a gifted man who, fortunately for the world, was passionately curious about electricity.

In the year 1667 before he was 25 years old Isaac Newton reported several discoveries destined to reshape world history. His interest in the movements of heavenly bodies led him to formulate his laws of motion which did more than anything else to establish experimental physics with its countless applications to engineering and industry. His curiosity about the nature of light led to his invention of the spectroscope, an instrument of present daily use in science, industry and medicine. Today we know the chemical composition of distant stars and can determine the presence and amounts of minute traces of potent hormones in our body fluids by the use of the spectroscope. Newtonian mechanics, built on the foundations laid by his great predecessor Galileo, made possible the industrial revolution which, for better or worse, has changed our way of life so much from that of the 18th Century. Newton's curiosity about the stars was a precipitating factor in the development of modern industry.

The history of developments in the applied sciences of engineering and medicine follows again and again a similar plan. Consider radio—Clerk Maxwell in the middle of the last century by a brilliant mathematical analysis predicted the existence and the properties of radio waves. In the 1870's a German physicist, Hertz, sent and detected these waves for the first time. In the last 50 years the curiosity of physicists about the conduction of electrical particles thru vacuum tubes has given us radio, including television and radar, and as a by-product the X-ray tube with its priceless aid to medical diagnosis and therapy—especially cancer therapy. Technics of physical medicine such as diathermy, electric cautery used in surgery, electroshock used in psychitary, and the electroencephalograph for the study of brain waves useful in neurological diagnosis are a direct by-product of fundamental investigations of the laws of

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motion of electrons. The electron microscope which enables us to see viruses, enzymes and other protein molecules is one of the most recent advances in this field.

Indeed, with the exceptions of the methods of psychotherapy one would be hard put to find any diagnostic technic or therapeutic procedure that is not the result of an application of research in the fundamental physical, chemical and biological sciences. This is true of the thermometer, the common microscope, the stethoscope and the electrocardiograph, in addition to the other things just mentioned. It is also true of anaesthetics, hormones, vitamins, antibiotics like penicillin and a host of useful drugs.

It is not too much to say that the emancipation of medicine from witchcraft and superstition may be directly measured by the development of the basic physical and biological sciences and by the philosophy of science which has resulted from these developments. It was the chemist, Pasteur, who, despite the opposition of medical practitioners, discovered the meaning of bacterial infection as a cause of many diseases. Today chemists, zoologists, bacteriologists and physiologists, thru their basic studies, have given us such things as vaccines, anaesthetics, the insecticides like DDT, the sulfa drugs and penicillin, the vitamins and hormones. Few if any of these things would be available to aid the sick were it not for the work of countless men and women curious, not about disease, but about the chemistry and physiology of normal cells, tissues and animals.

Since Hiroshima and Nagasaki only the dullest of us can be unaware of the release of forces destined to play an enormous role for good or evil in the future of civilization. While one atom bomb can wipe out a city of 100,000 people nuclear energy may soon revolutionize industry and society as did steam and electricity a century ago. Artificially radio active isotopes produced by the nuclear physicists have already resulted in striking medical advances.

In 1905 Albert Einstein published an obscure ten page mathematical paper pointing out that matter may be convertible directly into energy. His equation is very simple in its final form. It states that the energy equivalent of any given amount of material is equal to the mass of the material multiplied by the square of the velocity of light. From this one can calculate that a kilogram of matter, 2.2 pounds, contains locked up in it 25 billion kilowatt hours of energy, or about 25,000 times the output of the world's largest single hydroelectric power source, that at Grand Coulee Dam. This energy is equivalent, as Smyth has pointed out, to the total electric power industry of the United States running for two months. He compares this fantastic figure of 25 billion kilowatt hours with the 8.5 kilowatt hours of energy produced by burning 2.2 pounds of coal. By 1939 a number of physicists had put Einstein's equation to experimental test and proved it sound and the results were matters of international information among specialists. The rest as far as the bomb goes was mainly engineering and administration.

The present bombs are very inefficient, only a tiny fraction of their mass goes to energy, but even so, something between 4 and 200 pounds (the exact amount is still secret) of the partly fissionable material is equivalent to 20,000 tons of T.N.T.

While the bomb is one by-product of basic physics, artificially radioactive substances are another, and these are now becoming available to workers in the medical sciences. Radioactive isotopes can be made of all the 92 elements. These substances are chemically identical with the corresponding nonradioactiv normal elements differing only by a nuclear unit of mass. They are metabolized in the body exactly in the same way as are the corresponding normal elements. The radioactive isotopes release radiations that can be detected by suitable counting instruments. They thus signal their presence in the various body tissues in which they are incorporated after ingestion. In blood transfusion studies during the war under the direction of Drs. John Gibson, Joseph Aub and Robley Evans two different radioactive isotopes of iron were used. One was given to a person who would later serve

as experimental donor and in his body it was built into his blood hemoglobin; the other was given to the person later to be the blood recipient. Thus the hemoglobin in the corpuscles of each was tagged with a characteristic tracer. After the transfusion the donor's blood corpuscles could be identified in the recipient by their characteristic radiation. By this method the duration of life of the donor's and of the recipient's blood cells could be determined. The effect of various pretransfusion preservatives for blood could be assayed in relation to the duration of life of the red blood cells after their transfusion. By such experiments the standard that 70% of the transfused red blood cells must be present in the recipient 21 days after transfusion was determined. These technics also were invaluable in setting standards for the compatibility of blood type groups.

Radioactive phosphorus is built into bone as calcium phosphate the same as is normal phosphorus. Already some favorable results have been reported in the treatment of leukemia by radiations from artificially radioactivated phosphorus deposited in the bones. Radiations from this phosphorus destroy the hyperactivity of the blood cell forming marrow. In like manner hyperthyroidism has been successfully treated with radioactive iodine due to the fact that the thyroid concentrates radioactive iodine as it does normal iodine and the radiations reduce the activity of the gland.

Dr. C. P. Rhoads has recently held out hope for the treatment of cancer by the use of radioactive organic compounds synthesized with radioactive carbon or nitrogen. Thus in time it may be hoped that certain amino acids and proteins utilized by cancerous tissues may be synthesized and built into the cancer for its selective destruction. Radioactive carbon built into the sex hormones may prove of value in the treatment of cancers of the prostate, breast and uterus.

The applications to engineering and medical practice of the discoveries we have been discussing have emerged as interest payments to society from a broad understanding of physical and biological principles. Without this broad substratum of fundamental capital knowledge built by people concerned with understanding nature rather than with applications, the engineer and the physician would have little to work with—little more in fact than he had in the 17th Century.

It has been said that the idea which distinguished modern western civilization from that of all others is the belief of the part of many people that the investigation of nature quite aside from any foreseeable practical results is a matter of supreme practical importance. Perhaps this is man's greatest single discovery, and paradoxical as it may seem, this view has led to amazing practical advances—far more than have been yielded by a direct frontal attack on man's obvious problems.

One of the most distressing medical problems today is that presented by the mental patient. More hospital beds are required for these patients than for all other diseases combined. Despite the cost to the country of upwards of a billion dollars yearly for the care of these patients and for their economic losses as productive members of society, we spend only a small fraction of one percent of this amount on research in this field. Any industry that was losing millions annually and spent only about one tenth of one percent trying to find out why and how to stop the loss would fail, and would deserve to. Perhaps society as a whole can afford this sort of luxury but it is certain that a large investment for research in the field of nervous and mental diseases would be a good one. All therapy is a product of research. Only through research can we reduce the patient population of our mental hospitals.

It is an article of faith of most students of the biological sciences that human conduct from the simplest reflex to the achievements of a Newton or a Shakespeare depends upon the molecular functioning of the nervous system. Stanley Cobb has pointed out that in present day psychiatry the multiplicity of causes of psychopathological disturbances can profitably be expressed by the interplay of four main categories of events

—(1) genetic or hereditary causes, (2) histogenic causes due to visible lesions in tissues, (3) chemogenic causes due to submicroscopic molecular dysfunction and (4) psychogenic causes due to maladjustments in interpersonal relations. The habit of speaking of mental *or* physical factors he insists is misleading and wrong, both aspects are involved in all human behavior. Body chemistry can be changed by failure in interpersonal relations and these in turn depend on body chemistry and physiology. A disembodied psyche is an entirely meaningless concept. Our likes and dislikes—our behavior, normal and abnormal, is related directly to the molecular dynamics of our brain cells—of this much we can be certain. Mind and body form a unity and the research psychitrist should work in close collaboration with the physiologist and biochemist if we are to understand the nature and ultimately be able to treat effectively the so-called mental patients.

I should like now briefly to describe some recent work from our laboratory dealing with mental patients.

The adrenal glands are two small organs located on the top of each kidney. The gland has an inner region called the medulla and an outer part called the cortex. The physiology of the adrenal medulla during the past fifty years has become well understood. It secretes a substance called epinephrin or adrenin that serves as a booster for the action of the sympathetic nervous system. This substance has been chemically identified and synthesized in the laboratory and commercial epinephrin or adrenalin as it is called is useful in medical practice.

The adrenal cortex on the other hand secretes some twenty hormones all belonging to the class of compounds known as steroids and quite different chemically and pharmacologically from the single hormone epinephrin, from the adrenal medulla. These steroids belong to the same chemical family as do the sex hormones. In fact, the adrenal cortex actually secretes some sex hormone material itself although the sex apparatus, testes, ovaries, etc. are the principle source of the sex hormones. Of the twenty adrenal cortical hormones, aside from the sex hormones, some have not as yet been assigned any known physiological function, although the physiology of others is quite clear. Three of the adrenal cortical hormones, for example, are concerned with the conversion of nitrogenous substances into sugar and the storage of this potential fuel in the liver. Others are concerned with the salt and water balance in the body, particularly with the control of sodium and potassium, so essential to normal tissue function, including brain function.

Unlike the adrenal medulla which is under direct nerve control, the adrenal cortex is controlled by protein hormones released by the anterior pituitary gland. This master gland is in turn controlled by the nervous system probably through the hypothalamus by mechanisms that are still obscure.

During the war in collaboration with Dr. Pincus and others we studied the output of adrenal cortical hormones in man in response to a variety of stresses. Such stresses as flying airplanes, breathing air low in oxygen, exposures to high or low temperatures, long hours of exacting factory work and taking tough examinations all caused an enhanced output of adrenal cortical hormones which could be measured both by urinary and by blood assays. These adrenal stress responses varied, however, from one individual to another. Those men and women who experimentally were the most fatigued showed the greatest output of the hormone metabolites so that from urinary steroid analysis we were able to predict with a surprising degree of accuracy the ability of a normal person to withstand stress. The large steroid excreters were evidently not utilizing their hormone output efficiently. From these studies we were able to select a synthetic steroid pregnenolone that had no harmful effects but which decreased fatigability in experimental and in field situations by exerting a sparing action on the adrenal glands. This substance we found, for example, to significantly increase the piece-work output of factory workers in contrast to their levels when taking placebos, i.e., blank pills indistinguishable in appearance or taste from the hormone pills.

During the last three years we have studied the adrenal physiology of psychotic and of psychoneurotic patients. A group of some 30 psychotic patients (mostly schizophrenics at the Worcester State Hospital) were studied and show adrenal responses to stress that are quite different from those of normal persons. While the overall 24 hour output of adrenal cortical hormones is comparable to that of normal people, psychotic patients almost always show marked abnormalities in their stress responses. Since a characteristic of mental patients is that they have broken as a result of the stresses of life this basic failure of a fundamental stress response mechanism is especially interesting. In a group of 13 women suffering from involutional psychoses we found that these stress responses became normalized following successful electroshock therapy.

While the psychotic patients in general either show no stress responses of the adrenal cortex or erratic and delayed ones we were interested to find that a comparable number of psychoneurotic patients at the Massachusetts General Hospital and at the Worcester City Hospital out patient clinic often tend to show greatly exaggerated releases of adrenal metabolites in response to experimental stresses. In collaboration with Dr. Jacob Finesinger and Dr. William Malamud we have found that these responses are usually followed by marked depression of adrenal cortical activity after the stress.

Recent experiments suggest that in some patients these adrenal abnormalities may be due either to failure of the pituitary to stimulate the adrenal cortex or to failure of hypothalamic brain mechanisms to fire the pituitary. Research on the mechanisms involved is now under way.

I have described these studies because they indicate, more specifically than any others I know about, functional abnormalities of body chemistry in association with psychotic and psychoneurotic states. This work is only beginning, but it is not too much to hope that from such leads chemical means may become available for a rational therapy of mental patients. In fact, Dr. Malamud and I already have evidence that the steroid pregnenolone is helpful in relieving the symptoms of some psychoneurotic patients probably by way of its sparing action on their overtaxed adrenal mechanisms.

Fundamental research in the medical sciences is expensive and since no one can expect to make a direct financial profit it is difficult to finance. In this country it has depended mainly on the chance philanthropy of wealthy individuals. Since society as a whole benefits enormously from such research society should pay for it. This is realized more today than ever before and several federal agencies are embarking on the financing of basic research in universities, research institutes, and hospitals. The development of fundamental science is of far more concern to the Russian government, however, than it is to our own. If we are to maintain our international position in science, industry and medicine during the next fifty years it is of the utmost importance for our legislators ad administrators to become acquainted with the meaning and significance of the basic sciences and with the special and exacting conditions necessary for the advancement of sound scientific knowledge.

DISCUSSION

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It is not an easy task to discuss adequately and do full justice to a presentation that is so broad in its implications and that covers such a tremendous field, in the short time that is allotted to me. Logically, since I am primarily a clinician it would be desirable that I emphasize some of the practical applications of the material that Dr. Hoagland presented. I should, therefore, like to take up briefly only one special example of such practical application, namely the so-called *psychosomatic disturbances,* by which we understand the physical ailments that are produced by emotional stress situations.

I have chosen this subject, firstly, because it is of such tremendous importance in the practice of medicine in general. It is a well-known fact that a major portion of the neuropsychiatric disabilities for which men-

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bers of the armed forces were discharged belong to this field, and this does not include a large number of cases that were diagnosed as somatic diseases but were primarily due to personality problems.

It is also true that in civilian practice these conditions are frequently encountered. Well-known and conservative internists, for instance, tell us that a large number of patients in hospitals belong to this group of diseases.

The second reason why I consider this an important subject to discuss, is that the history of the development of this field follows almost identically the lines that were indicated both by Dr. Sleeper and Dr. Hoagland. Isolated observations for centuries have finally led to systematic research which at the outset did not seem to bear any definite relationship to the practical problem of somatic disease. Surely, when W. B. Cannon some thirty years ago was carrying on experiments in which he exposed cats to effects of rage and fear produced by barking dogs and then studied such things as their blood sugar, adrenal gland function, and gastric secretions, very few of the uninitiated could see any particular relationship between that and human illnesses. Some of the more enlightened could see possibilities and promise in this work, and numerous investigations were stimulated which were carried on for many years.

It took a major social catastrophe, the recent world war, to bring out these relationships in so obvious a manner that not only physicians but even the general public began to realize the importance of this research work. The unusual and severe strain that military life, particularly combat experience, has imposed upon those in the military services and the stress situations to which even the civilian population was subjected during the war have led to a marked increase in these ailments. Furthermore, the fact that they have developed over so short a period of time brought out the relationship between emotional stress and physical disease much more strikingly than the slow processes in normal times. Actually, in our clinics where we see a good deal of veteran material, we come across these conditions very frequently and we have all come to realize the magnitude and importance of this problem. The various gastro-intestinal disturbances, dysfunctions in the cardio-vascular system, respiration, skin, endocrine glands and numerous others show definite evidence of the fact that emotional stress is responsible for a high proportion of illnesses hitherto considered as of physical origin.

Today, we all agree that Cannon's investigations have definitely proven their practical applicability, but the work is far from complete. Further investigations are needed to determine the exact relationships between psychological experience and physiological functions. Adequate and practically applicable methods of treatment must be developed to deal with the problems. What is more important, we must discover ways and means of checking the deleterious effects of emotional stress upon the system and thus developed preventive measures. Finally, a great deal is to be done in regard to education. The importance of personality disturbances in the development of physical ailment should be clearly presented to all medical students so that when they graduate they will know what these implications are.

Biologically, man has been endowed with a nervous system, the most differentiated part of which is the brain. This system has as its function the regulation and maintenance of measures of adjustment to life stresses. Man, in contradistinction to the lower animals, is capable by virtue of higher differentiation of his nervous system to adjust himself not only to stress of an immediate nature but such that may occur in the future. Because of this, he can prepare himself for potential danger and, in this way, be able to deal with it more effectively. Research work is one of the highest expressions of this type of adjustability. The utilization of this function is not only a privilege but a sacred duty to the power that has endowed us with it, to our contemporaries whose illnesses we treat, and to posterity whose welfare is dependent upon our own adequate use of this function.

Practical Value of Convulsive Shock Therapy Research

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Worth-while progress in psychiatry is the product of research, as is true in modern industry and agriculture with their increasingly important research facilities. The brilliant progress in the control of infections that immortalized Lister, Pasteur, Koch and Reed, drew vast private endowments for medical research. To further the control of epidemics, intelligent public health legislation was needed and the government was invited into this field of medical science. Good care for the insane was likewise seen to be beyond the resources of the average family and in Massachusetts, state hospitals for the insane are nearly as old as "pest houses" or qurantine hospitals. The virtues of public health justified her favored position when funds for research were apportioned but now another's turn has come. Psychiatry has too long been the step-child of the medical science family. Psychiatric research up to the present has been fed such a feeble diet of funds that only now is the infant lusty enough to disturb the public by shouting for more than the crumbs that have fallen inadvertently but providentially from the hands of her sisters, pathology, physiology, chemistry, and psychology. Psychiatric research had not found its feet or its tongue when workers from other fields began to solve the riddle of general paralysis of the insane less than half a century ago. The chronic delusional insane of middle life proved a sterile field for pathologists thereafter. Psychological research established the basis for the understanding and treatment of the milder personality and character disorders, yet the care of the queer "precocious dements," the chronic cases of dementia praecox, was still unchanged after more than twenty centuries. It is only in the past twenty years that psychiatry has made use of both psychology and physiology to study the more stubborn illnesses of asylum patients. Pharmacologic studies soon gave some promise. Insulin was found to have a sedative effect on mental excitement.

In 1928 drug addicts and delirium tremens patients were being treated with insulin and one day a patient, who also had dementia praecox, accidentally received an unusually large dose. Upon recovering from the treatment, he showed definite improvement in the underlying chronic mental illness. Repeated larger doses of insulin in other dementia praecox patients gave better results than water cures, pills, vaccines or attempts at hypnotism. After six years of study of insulin's effects on dementia praecox patients, Sakel announced his promising results and methods in 1934. By 1937 others had confirmed Sakel's work and insulin shock therapy was widely adopted, though it was tedious, expensive and as risky to life as an uncomplicated appendix operation.

Some psychiatrists noticed that a convulsion improved the mental condition of the dementia praecox patient and a mutual antagonism of the two conditions was postulated. In 1933 von Meduna intentionally produced convulsions in dementia praecox patients by injections of camphor in oil. A synthetic camphor substitute, later named metrazol, permitted rapid intravenous administration of more effective, less toxic convulsant doses. Metrazol convulsive shock therapy was reported by von Meduna in 1938 after five years' experience demonstrated that, compared with insulin, it offered the advantages of fewer complications, shorter treatment period, considerable economy and about as good results as were claimed for insulin. In 1939 Cerletti and Bini reported the advantages of electricity over metrazol as a convulsant, being much less unpleasant and less expensive.

In 1939 von Meduna and Friedman were able to report results in 3,000 cases of convulsion therapy. In those dementia praecox patients ill less than 18 months, 52% had a remission, substantially the same rate claimed for insulin shock therapy. This

claim was challenged by some insulin shock workers. The protagonists for insulin therapy made inadequate if any attempts to determine whether their treated cases were properly comparable to those given metrazol or no shock therapy at all.

In contrast to the report of von Meduna and Friedman is that of Ross and Malzberg the same year. The latter workers stated that of 1,757 dementia praecox patients treated with insulin in New York state 11.1% were recovered and an additional 26.5% were much improved. Dementia praecox patients not given any pharmacologic shock therapy had previously shown a recovery rate of 3.5% with an additional 14.7% much improved. Metrazol convulsive treatment given 1,140 dementia praecox patients in New York state institutions had brought about only 1.6% recoveries and 11.5% much improved, a showing much poorer than for the control group. The degree to which the three groups were truly comparable was unanswered.

Van Meduna and Friedman noted that their 52% remission rate for metrazol treatment of acute and sub-acute cases of dementia praecox fell to 10% when symptoms had been present more than 18 months. Rossman and Cline also reported similar findings with insulin, 10% remissions following treatment of dementia praecox patients ill more than 12 months. This agreement suggested that the duration of symptoms was the critical factor explaining the disparity of results. The confusion was aggravated by the therapists' tendency to use the newer therapy first with chronic patients where there was very little to lose if complications were encountered. The older more familiar treatment was applied to the acute cases with a better prognosis. Statistical results are thereby heavily weighted against the newer therapy.

Recovery rates for dementia praecox patients not given shock therapy vary nearly as widely as for those given shock treatment, according to recent American reports, varying from 3.5% to 40%. Again the duration of symptoms before the patient came under treatment may explain the disparity. Only when control cases of similar type, intensity and duration of symptoms are compared over equal periods of time with their matched groups given a particular treatment, can the value of that treatment be accurately determined.

The need for more careful investigation of the value of convulsive metrazol shock therapy was once more apparent after ten Massachusetts mental hospitals made a cooperative study of their results in 1941 under auspices of the Massachusetts Society for Research in Psychiatry. (See Chart I.) All patients treated with metrazol in the year ending April 1, 1940 were evaluated in April 1941. Two hospitals reported 34% recoveries among dementia praecox patients but four hospitals reported no recoveries at all. One hospital reported that only 14% of dementia praecox patients were unimproved after treatment but in another hospital 100% were unimproved. Two hospitals stated that none of their metrazol treated patients were at home at the time of the report but in a third hospital 73% of their metrazol treated dementia praecox patients were at home. I do not believe that it was mere coincidence that the hospital with the longest experience with this treatment and treating the largest number, one quarter of the total, reported the best results. As the experienced industrial executive would expect, this hospital had the advantage of an active research program, the value of which is clearly shown.

An important part of the Massachusetts cooperative metrazol study of 1941 was the effort made to find which of 20 common mental symptoms were most effectively removed by the treatment. The present author made a similar study in a matched group of dementia praecox patients treated before the shock therapy program was instituted. Comparison of two groups of Worcester State Hospital patients was published recently by Benjamin Simon* and this author. A summary of the results is as follows: Symptoms most promptly obliterated are suicidal attempts 95%, refusal of food 93%, untidiness 82%, bizarre acts 75%, refusal to speak 70%, depression 69%, anx-

iety 68%, overactivity 66%, hallucinations 62%, overtalkativeness 60%, delusions 57%, bizarre speech 57%, confusion and bewilderment 55%, underactivity 51%, disorientation 50%, lack of interest 50%, open sexual activity 47%, inappropriate mood 42%, euphoria 15%. Memory was worse for a few weeks after treatment but improved quickly thereafter. The immediate recovery from a symptom averaged 58% and was well main-

Results of Metrazol Treatment in 231 Dementia Praecox Patients As Seen One to Two Years Later in Ten Massachusetts Hospitals In Relation to Age, Duration of Illness, Amount of Treatment and Return to Community.

	No. Pts.	Av. Age Pts.	Av. Dura. Before R	Convuls. Given	Home 1 Yr. Later	RESULTS ONE YEAR AFTER TREATMENT		
Hospital	Total	Years	Months	No.	%	Recovered	Improved	Unimproved
Worcester State	79	33	26	18	73%	34%	51%	14%
Danvers State	52	27	41	10	46%	20%	31%	49%
Northampton State	29	31	18	12	31%	14%	41%	45%
Grafton State	3	33		11	0%	0	33%	67%
Taunton State	19	28	40	12	42%	16%	32%	52%
Westborough State	6	33	55	16	0%	0	0	100%
Medfield State	20	28	37	16	40%	35%	5%	60%
Foxborough State	16	25	26	14	50%	25%	44%	31%
Boston Psychopathic	3	22	12	5	67%	0	67%	33%
McLean	4	30	6	5	50%	0	50%	50%
	231	30	38	13	51%	24%	37%	39%

Note: All patients were treated between April 1, 1939 and March 31, 1940.

CHART I

Results of Metrazol Treatment of 123 Dementia Praecox Patients One Year Later Compared with 104 Control Patients of Similar Duration.

No. Pts.		Recovered	Much* Improved	Improved	** Unimproved	Worse
62	Acute Metrazol Patients Ill Less than 1 Year	45%	26%	19%	10%	0
61	Acute Control Patients Ill Less than 1 Year	26%	16%	35%	16%	7%
32	Sub-Acute Metrazol Patients Ill 1 to 3 Years	16%	19%	31%	34%	0
11	Sub-Acute Control Patients Ill 1 to 3 Years	0	9%	46%	45%	0
29	Chronic Metrazol Patients Ill 3 or More Year	0	7%	45%	41%	7%
32	Chronic Control Patients Ill 3 or More Years	3%	3%	41%	44%	9%

*Disappearance of more than 75% of symptoms considered much improved.

**Less than 25% change in Symptoms considered unimproved.

CHART II

tained, for over a year later the average had risen to 74%, some 21% higher than for controls.

The present study is an extension of the above undertaking, attention being focused upon proving that the controls and metrazol groups were or were not well matched in number and severity of the 20 common mental symptoms. Attention was also directed toward the relative effectiveness of metrazol treatment of acute, sub-acute and chronic cases, and the degree to which outcome is influenced by duration of symptoms before admission of the control patients. This study made possible the measurement of the degree of improvement resulting from treatment and the amount hospitalization was shortened within the period of this report.

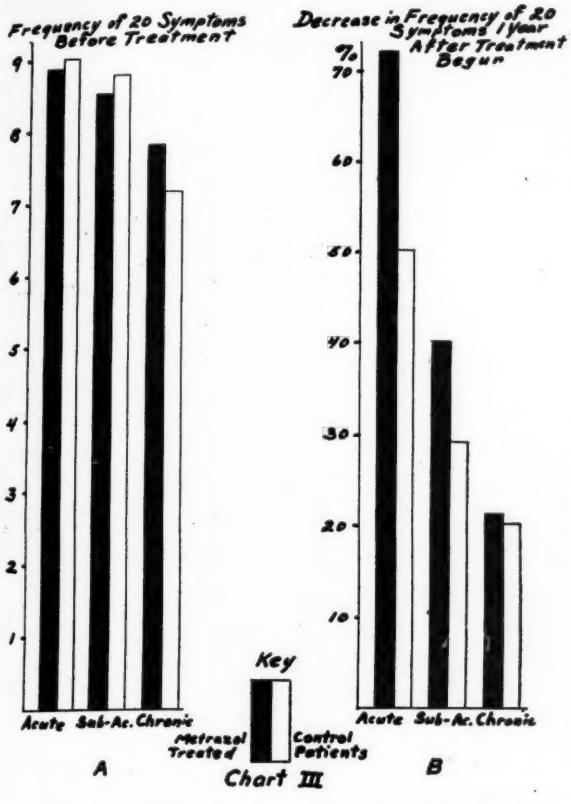

Chart III

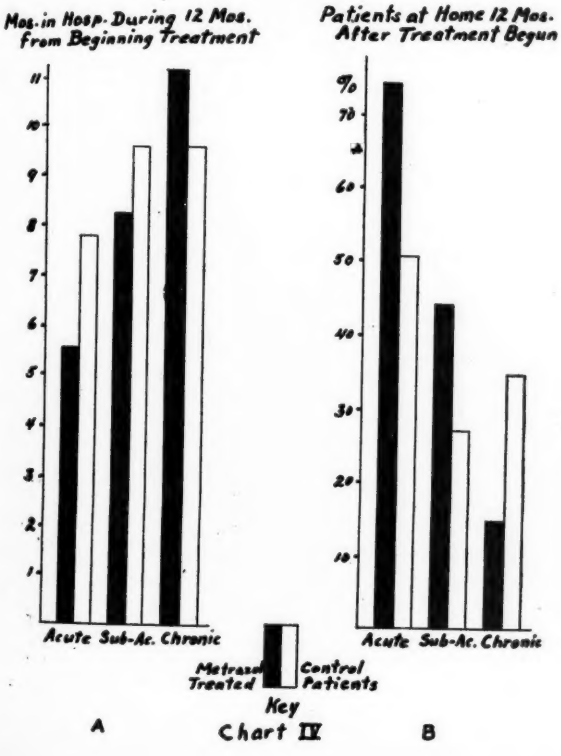

Chart IV

Results

In the 62 metrazol treated patients where symptoms were present for not more than one year before treatment was begun, results a year later were 45% recovered, 26% much improved, 19% improved, 10% unchanged and 74% were at home. In 61 control dementia praecox patients ill not over a year before admission, results a year later were 26% recovered, 16% much improved, 35% improved, 16% unchanged, 7% worse, and 51% were at home, a 23% gain in patients sent home for metrazol when used in acute cases. (See Chart II.)

Where symptoms of dementia praecox were present for more than one year but less than three years in 32 metrazol treated patients a year later, 16% were recovered, 19% much improved (more than 75% of symptoms had disappeared), 31% improved, 34% unchanged (less than 25% change in symptom intensity or frequency), and 44% were at home. Of the controls, none were recovered, 9% were much improved, 46% improved, 45% unchanged and 27% were at home, a 17% credit to metrazol when used in sub-acute cases.

Where dementia praecox was chronic (present for three or more years) before metrazol treatment was begun, none recovered among 28 treated, 7% were much improved, 45% improved, 41% did not change, 7% were worse and 14% were at home. Among 32 controls 3% recovered, 3% were much improved, 41% were improved, 44% were unchanged, 9% were worse but 34%

were at home a year after admission, a 20% deficit for metrazol when given to chronic cases.

The severity of the illness of the controls matched against the metrazol treated cases of dementia praecox was studied in terms of the presence and intensity of these 20 symptoms. Average symptom intensity was matched within 1% for the acute and sub-acute groups and within 4% for the chronic group, the controls being less intensely affected. The number of symptoms present averaged within 2% for the acute and sub-acute groups, the controls having a slightly greater number. Among the chronic cases the controls had 10% fewer symptoms and this no doubt contributes significantly to a better relative showing made by this group of controls compared to the metrazol treated chronic cases. (See Chart III A.)

One year after metrazol treatment was begun on acute cases of dementia praecox, a 71% decrease in average intensity and a 72% decrease in the number of symptoms was apparent. (See Chart III B.) The control group of acute cases showed 51% decrease in symptom intensity and a 50% decrease in number of symptoms. In the sub-acute cases given metrazol a 46% decrease in symptom intensity and a 40% decrease in symptoms frequency was evident a year later, figures that still compared favorably with 37% intensity and 27% frequency decrease among the controls. In the chronic dementia praecox group (ill over 3 years) metrazol treatment was followed by a 28% decrease in symptom intensity, only slightly better than the 23% decrease shown by the controls. A 21% decrease in the number of symptoms a year after metrazol treatment of chronic cases shows this treatment to be of little if any value, as the control group showed a 20% decrease, a nearly identical figure. These figures make it apparent that only in the acute and sub-acute cases is metrazol treatment of dementia praecox of lasting benefit.

Of a group of 35 patients with other types of diagnoses, metrazol treatment in the first year of illness resulted in 91% being out of the hospital a year later compared to 74% for a control group, 17% credit to metrazol used in acute cases, a figure in substantial agreement with the findings for dementia praecox treatment. Unfortunately only the dementia praecox group was large enough to warrant detailed analysis.

Relatives often ask whether convulsive therapy will materially shorten the period of hospitalization. The answer to this question is also of importance to the hospital administrator and governmental bodies. Convulsive therapy of acute cases of dementia praecox shortened their hospital stay by 29%. Cases ill one to three years had their stay shortened 14% by convulsive therapy. Dementia praecox patients ill over three years and given metrazol remained in the hospital 18% longer than did a control group. (See Chart IV.) A year after treatment 20% fewer were at home among the metrazol treated chronic cases than among the control patients. (See Chart IV B.)

Often relatives of patients are so fearful of any drastic or unpleasant treatment of the patient that they withhold permission for convulsive shock treatment until the illness has long been chronic. It is hard for the doctor to refuse to give convulsive treatment when at last requested to do so, though he may believe treatment has become of little value. Establishing the fact that convulsive therapy of the chronic dementia praecox patient is futile in terms of speeding improvement or release, enables the busy ward physician to either obtain early consent for this treatment or to later effectively ward off pressure to waste time and money in useless therapy. This present study may also point out that the time may have been reached to recommend other treatment, such as lobotomy.

Conclusion

Convulsive therapy given dementia praecox patients in the first year of the illness saves an average of 2 months of hospitalization and is of little or no value after the third year of the illness. Research established convulsive therapy as a method and further research can make the method even more profitable. Investment in psychiatric

research is the best way to speed the rehabilitation of the mentally ill and to lighten the cost to the state. Had all dementia praecox patients admitted in 1940 been treated with metrazol, 300 more would have been returned to their homes at a saving of $38,000 to the Commonwealth, figured on a per capita cost of $8.14 a week. The number of patients with mood disorders sent home could have been increased by a sixth. Restored productiveness of these patients makes the gain to the community even more significant.

DISCUSSION

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Dr. Holt has summarized for us in a few minutes many months of painstaking research. In his paper today, he told us that of 62 patients he treated who had been ill less than a year, 74% were well enough to be at home. The value of early treatment was made clear by the fact that the number of patients well enough to go home dropped to 44% when the patient had been ill between 1 and 3 years and to 14% if the patient was ill more than 3 years.

Danziger and Kindwall[1] painstakingly determinated the probability of recovery in dementia praecox treated symptomatically in state hospitals without shock therapy. They studied some 18,000 cases. The probability of recovery on admission was found to be 0.05. They then analyzed 145 courses of insulin shock and 322 courses of electric shock therapy. They used the course of treatment rather than the patient as the statistical unit; 45% of the courses of insulin treatment and 34% of the courses of electric shock treatment ended in recovery of the patient. When these results were compared with the controls, a remarkable difference was found and the odds against such a difference being due to chance were more than a billion to one.

Kaldeck[2] working at the Boston State Hospital gave 2069 electric shock treatments to 248 patients between 1942 and June of 1946. No fatality occurred in connection with electric shock therapy during this period and only one case of spine fracture was observed. Of the treated patients 34% left the hospital within three months after treatment and 30% more were improved. Of 63 patients with a diagnosis of manic depressive psychosis or involutional melancholia, 64% left the hospital within 3 months after treatment, compared with 24% of 185 schizophrenics. Of 100 patients who were treated by shock therapy who had been ill less than six months, 61% left the hospital within 3 months. This once again emphasizes the tremendous importance of early treatment of certain forms of mental illness with electric shock therapy.

Research has proven the value of shock therapy in the treatment of involutional melancholia, manic depressive psychoses, and dementia praecox. Even moderate cardiac disorders and age[3] need not be a contraindication to its use if care is exercised. Having demonstrated the efficacy of the treatment, the important consideration is to give it early to all who need it. To do this it is necessary to get patients into the hospital early enough in the course of their illness. Once in the hospital, the treatment should be applied promptly. Too often valuable time is lost during a fixed observation period of thirty or forty days when no useful purpose is served in delaying the treatment and actual harm may be done. The patient can usually be sent home following shock therapy after only a short period of post-shock observation. The optimism engendered by the treatment should not be dissipated through delaying actions.

More research on the value of shock therapy on specific symptoms would be helpful, particularly its influence on the chronic disorders, such as destructiveness, untidiness, poor eating habits, assaultiveness, etc.

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The Need for Research In Mental Deficiency

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It has been aptly said that those working in one field of research or another are always endeavoring to apply research discoveries to their work with patients. Unfortunately, however, we have become so engrossed in our work that we have neglected to review for ourselves, and for the benefit of the public in general, what we have accomplished. It goes without saying that scientific research has gone far in reducing illness and suffering. Research may also be used in such a way that it will tend to reduce the expenditure of the large sums of money which are required to provide institutions to care for these mentally deficient patients. It is most important to continue and expand progressive research if we are to continue our progress toward solution of the problem.

The problem of mental deficiency is a many-sided one. Although it is primarily a medical problem, feeblemindedness is also an educational, a psychological, a sociological and a legal problem. It is quite generally agreed that more viewpoints are involved in the comprehension of mental deficiency than in any other branch of psychiatry. The problem also has ramifications outside the professional fields; for example, it reaches out into industry, labor and agriculture, as well as to the military services. Ways and means must be discovered of developing gainful employment for mentally deficient persons. Many find their way into these fields and present the problem as to how they can be best utilized. They represent a large source of manpower used extensively during the war, and means can and must be discovered so that they can be permanently employed. Because of these ramifications, a sound program of research is necessary in all these fields, so that these persons may be of value to the community.

I find no satisfactory definition that will cover all aspects of feebremindedness although Dr. Ransom A. Greene, my predecessor at the Walter E. Fernald State School, has provided a workable definition. It is as follows:—"A feebleminded person is one who has a mental defect existing from birth or early infancy to such a degree, that he is prevented from competing on equal terms with his normal fellows." Here I would like to correct a popular misunderstanding regarding mental deficiency. The average person is inclined to think of a mentally deficient person as one who is hopelessly stupid and unable to learn even the rudimentary care of himself and his body. They think of him as being in a hopeless condition for which little, if anything, can be done. This is far from the truth.

While it is generally recognized that the concept of physical health covers a wide area of conditions, ranging from a mild head-cold to severe illness such as terminal lobar pneumonia, feeblemindedness, however, is often regarded as black or white; either the patient is a helpless idiot or he is completely normal; and the possibility of something in between has not been considered. Actually, of course, feeblemindedness like physical health ranges all the way from mild to severe. Milder cases will usually benefit from the special education provided in State Schools. They can be trained to become useful and self-supporting citizens. With proper methods even the lower grade patients can be trained to make an acceptable institutional adjustment. Therefore the situation is not hopeless but we must not be content with present methods of training. We must constantly seek through research for better methods to prepare these individuals so that they may be helped to develop and utilize to the utmost their inherent capabilities.

The magnitude of the problem of mental deficiency can only be estimated. Actually there are many feebleminded individuals

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who are adjusting in the community without attracting undue attention. Others are being provided for by relatives or social agencies. Only a very small proportion are cared for in institutions. From available figures it is conservatively estimated that there are over 1,500,000 feebleminded persons in the United States. From the latest figures available to me from the Department of Mental Health, it is estimated that there are 115,000 in Massachusetts alone, with a little over 5,000 in the three state institutions. The efficient capacity of these institutions is about 4,000; therefore, they are overcrowded by one thousand patients, or an average of 25%. Isolated services are overcrowded to as high as 49%. There is a waiting list for admission of this type of patient of approximately 4,200. It is apparent then that Massachusetts is doing only half the job required for the institutional care of the feebleminded. I do not mean to imply that all of the 115,000 require institutional care. The fact is that about 10% do require such care and we have facilities for only 5%. The mere building of new institutions to provide for those who urgently need institutional care will do nothing to reduce the large numbers of these persons. A well coordinated program of research is our only hope. The total cost of care for these individuals is staggering. It is estimated very conservatively that at the present time $40 million annually is required to provide for their care in institutions in the United States. It is impossible to estimate the cost to relatives and social agencies to care for those outside institutions. One can readily agree, therefore, with many leading authorities that the problem of mental deficiency, including those within and without institutions, is as great, if not greater, than the problem of psychosis or mental disease.

It should be plainly evident that in order to make any inroads into this vast problem of mental deficiency and relieve the burden of suffering, the heartaches, and the cost to taxpayers, a carefully planned scientific program of research must be developed and maintained. Unfortunately, however, adequate research facilities are lacking in this field. One can practically count on the fingers of one hand the institutions having adequate research programs. Two of those institutions are in this state. The work in mongolism, for example, at the Wrentham State School under Doctors Raymond and Benda has received world-wide recognition. At the Walter E. Fernald State School, we have, under the direction of Dr. Paul I. Yakovlev, an important research program in basic neurobiologic research, which has also received wide recognition. No discussion of research would be complete without mention of the outstanding contributions of Doctors Fernald, Wallace and Greene in this particular field.

It is my understanding that the research program at Wrentham is financed mostly by State funds. At the Walter E. Fernald State School, however, the research is made possible, in a large measure, through the private funds of the Corporation of the institution whose trustees and members have displayed marked farsightedness and understanding.

Let us now turn to consideration of instances where scientific research has paid dividends in terms of prevention and understanding of the pathologic processes involved. Because of the very nature of the problem, the most fruitful paths of research will be along lines of prevention and early treatment. Often the changes in the nervous system causing mental defect are irreversible unless prevented or treated early and adequately.

Cretinism is an unfortunate state which can usually be recognized without difficulty very early in life. Research has proven that this condition is due to a lack of a sufficient quantity of thyroid secretion for normal development. Cretinism should be recognized in the first year of life and treated immediately and continuously with thyroid extract. If these cases are not recognized and treated properly they will not develop mentally beyond an imbecile level of intelligence. Physically, they will not grow properly and will become dwarfs. If, however, treatment by the administration of adequate doses of thyroid extract is started early enough and continued properly, an approach toward nor-

mality, both mental and physical, can be expected. Thanks to the discovery of the cause, cretinism is now a medical rarity. This is a shining example of the dividends that research can pay, since these individuals can be made useful members of society, instead of remaining hopelessly feeble-minded.

Mention has already been made of the work in mongolism at the Wrentham State School. In practical application Dr. Benda's work indicates that it may be possible to recognize mongolism in the foetus during the first few months of pregnancy. Dr. Raymond has called attention to the fact that if this is true, the next step will be further research to discover what treatment is required to modify conditions in the mother which result in a mongoloid child.

Due to research, much knowledge has been gained about the so-called accidental or acquired types of mental defect. This knowledge has resulted in the improvement of prenatal care, in the methods of managing delivery, and the care in the critical post-natal period. We now have on record many important contributions which directly relate the development of mental deficiency to some accident in these critical periods. It is known that some of the drugs and anesthetics formerly used to free the mother from pain during delivery have contributed to an increase in the incidence of asphyxia or lack of sufficient oxygen in the newborn. Mental deficiency of a serious type has been a frequent aftermath of brain damage. As the result of all this information, it became obvious that many of these factors could be controlled or even prevented. Therefore, many of the more important hospitals and the better informed obstetricians are taking cognizance of these dangers and making every effort to overcome them. Thus, in large measure, many cases of mental deficiency are being prevented.

Recently there has been much interest on the part of the public in the so-called Rh factor in the blood. Many articles have appeared in the popular press, and of course a great deal of interest has been shown in the medical field. Not only does this factor play an important role in a certain type of acquired anemia in adults after transfusion, but it is also known that it plays an important part in the production of serious illness in children. This condition has had a high mortality rate, as high as 70%. Many survivors have shown residuals of brain damage. Extensive research has been done on this particular problem, and studies indicate that where one parent is Rh positive the resultant changes taking place in the developing child before birth may result in mental deficiency. Cases are now on record where persons with this condition have been successfully treated by repeated transfusions of Rh negative blood of the proper type, thus eliminating the anti-Rh substance within the circulation. As a result of this knowledge, many lying-in hospitals are studying the Rh factors of prospective parents as a routine measure. Therefore, they are accumulating Rh negative blood of the various types and maintaining a file of Rh negative donors for just such emergencies. The practical aspect of this important research is that the Rh factor plays a role in causing mental deficiency and attention can now be turned to preventing its disastrous effects. The blood of a pregnant woman can be tested for the factors which, if present, will give warning of the danger of the involvement of the child. Thus, appropriate treatment may be facilitated immediately after the birth. Further development of research in this problem are awaited with great interest.

The role of the various head injuries occurring at birth or in early childhood in the causation of mental deficiency is becoming more defined. We now know that many of these injuries result in serious hemorrhages which may go undetected in a cursory examination. If these hemorrhages and the resultant clots are not treated properly, the child may die or he may become mentally deficient with a paralysis of some type or other. Many valuable papers have been published demonstrating that with proper treatment and management many of these unfortunate youngsters can be spared a life of mental deficiency. Surgical techniques for the relief of these conditions have been

greatly improved, resulting in a normal life for many of these injured children.

With the development of more refined neuro-surgical technique, many congenital malformations of the brain previously thought to be inoperable are now amenable to surgical treatment. Many neurosurgeons are taking an increasing interest in the surgical treatment of hydrocephalus, various malformations and tumors, many of which can be alleviated if not cured by surgery, provided the location is favorable. Sufficient success has been encountered in these conditions to warrant the continuation of the effort to cure, or at least ameliorate a condition which was heretofore considered hopeless.

We are acutely aware of the seriousness of many of the so-called childhood diseases, particularly in relation to their complications, if the disease occurs early in life. We know for example that many accidental cases of mental deficiency are directly due to inflammation of the brain from such common diseases as measles, mumps, whooping cough and scarlet fever, particularly if such diseases occur during the first year of life. Recent work has shown that rheumatic heart disease may produce an inflammation of the brain which may be disastrous. Many of these serious complications, it is hoped, can and should be prevented through the proper use of better sera and the newer drugs now available such as the sulpha drugs, penicillin and others that are being rapidly developed.

Practically all the conditions, which I have used as examples of the value of research, and I have by no means exhausted the list, belong in the so-called acquired or accidental type of mental deficiency. As one can readily see, great strides have been made in understanding the causal relationships.

There remains however another type, the so-called undifferentiated or endogenous type which comprises the majority of feebleminded persons. Whether these cases are actually due to heredity or otherwise is of little concern. The fact remains that very little coordinated research has been attempted in this field. At any rate, the lack of knowledge in the field of human heredity is exceedingly great. Every year hundreds of thousands of dollars are spent in hereditary studies of insects, birds and animals with the view of improving the stock. It can be truthfully said that practically nothing is being spent in the human field. Certainly more scientific studies in heredity must be carried on in order to provide the answers to a number of questions. Research in the field of mental deficiency involves studies in areas allied to medicine, particularly in psychological, educational and social spheres. Fundamental research in the developmental pathology of the fore-brain in mental deficiency is immediately urgent. The Research Unit of the Walter E. Fernald State School has been working on this program for the past eight years with limited funds, facilities and personnel. A greatly expanded program can be fully justified by the results already achieved in this particular field of neurobiological research.

There is no evidence to indicate that our population breeds more feebleminded children now than it did 50, 100, or 300 years ago. The increase in demand for care of the feebleminded, and the increase of feebleminded "on record" are due in part to the increase of the population in general. But chiefly it is due to the increase in the uses of machinery in our life, and the increase in complexity of our society. One hundred years ago a moron and even an imbecile could be useful on a farm or in a shop, for most of the work was done by hand. If a feebleminded person was not very socially crippled there were many uses for him helping intelligent workers who used hand tools.

But now machinery takes over most of the work that formerly was done by hand. We are developing a highly mechanized society. To run machinery does not take great physical force but it requires intelligence. The premium on the intelligence required to get along in this world becomes ever higher, so there are more of those who cannot pay that premium, cannot apply their available physical means for work, for the demand is

for intelligence—for brains, rather than for brawn—physical power.

There is a great field of research to find out how the sheer power of the feebleminded can be best utilized. We should search for possibilities to make for them a place in the productive community and to add to their dignity of which they are deprived because of accidental, or inherited lack of intelligence.

Research in education of the feebleminded, in their occupational training and in the nature of intelligence to help them become capable to use machinery is one of the great problems of the day.

I would like to mention an experiment which we are conducting at the present time at the Walter E. Fernald State School which we hope may eventually result in considerable saving to the taxpayer. We are accepting, as day pupils, a small group of children whom we are unable to admit because of overcrowded conditions and shortage of personnel, with the view of providing education for those who are unable to receive instruction in the public school system. If we find this experiment successful, it may be enlarged to the point where we can receive more of these unfortunate children and provide some education for them without the expense of maintenance within the institution. This is an example of how some tangible saving can be rendered to the taxpayer by using existing facilities at our disposal, and without additional cost to the State. Although I have in this paper confined myself largely to a discussion of medical research in the field of mental deficiency, this experiment is an example of research which can be carried out in an allied field, in this case, education.

I have attempted to outline some of the tangible and valuable dividends paid by research in the field of mental deficiency. I have also indicated where further research may be carried out. In order to make any progress in this tremendous problem our research programs must not only be continued but expanded. Mental deficiency does not respect race, creed, color or social standing, and members of many of our finest families have fallen victim to this condition. The benefits already obtained as the result of research effort are most encouraging. Many families can be spared the anguish of having a birth-injured mentally deficient child, and many hitherto hopeless cases, as the result of proper preventive and treatment methods, are enabled to approach the normal both mentally and physically. We must replace the purely custodial aspect of institutions for the feebleminded by a program of research to light the way toward prevention, improved treatment and better methods. Massachusetts has long been a leader in the field of research and in the treatment of mental diseases. We must maintain that position and provide an example for others to follow, and follow they will if we can show that our research programs are scientific and practical and that they point the way toward a solution of this tremendous problem. Much can and should be done to attain these objectives.

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The Practical Value of Research in the Psychoses of Later Life

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Mental disorders in later life represent a heavy and increasing burden to the mental hospitals of Massachusetts. At the Worcester State Hospital, 41.9% of all first admissions during the year ending June 30, 1945 were patients 60 years of age or older. The figures for previous years were somewhat lower, namely, 35.3% in 1944, 33.7% in 1943 and 28.7% in 1926, indicating an upward trend in recent times. Since the great majority of these older patients are suffering from senile psychoses or psychoses with cerebral arteriosclerosis, the present discussion will be confined to them. The two disorders, taken together, accounted for 33.7% of all first admissions to the Worcester State Hospital in the year ending June 30, 1945, 28.9% in 1944, and 27.2% in 1943. On a state-wide basis, they accounted for 29.1% in 1945, 29.2% in 1944, 27.6% in 1943,[1] and 22.1% in 1926,[2] again indicating an upward trend in the admissions of old persons.

Dayton[3] was one of the first to emphasize the urgency of the problem presented by mental diseases of elderly life. From his work on statistics published in 1940 he concluded that senile and arteriosclerotic psychoses each showed a higher incidence than all other psychoses combined, and that mental disorders associated with ageing now appeared as the leading problem of psychiatry. It is a well known fact that the percentage of old people in the general population is steadily increasing, and as a consequence we are faced with the prospect of a constant increase in the number of senile and arteriosclerotic cases. Kolb[4] has estimated that if present admission rates and population trends continue, we may expect by the year 1980 an increase of 200% in the number of first admissions to state mental hospitals for the disorders under discussion.

What are we going to do with these patients, who already constitute about one-third of our new admissions and will probably account for a much larger proportion, if something is not done to alter the upward trend? In my opinion, the state cannot afford to wait for outsiders to try and solve the pressing problems presented by such a large influx of old and broken down persons to our mental hospitals. Since the state has made itself responsible for their care, it seems a matter of common sense (as well as dollars and cents), for the state to be primarily concerned in improving the situation.

The answer is research. It scarcely seems necessary to emphasize that practically all advances in medicine leading to prevention or more successful treatment of disease are accomplished through research. Research into some types of mental disorder has already been of great value, not only in restoring sick persons to health but also in terms of money saving to the state.

What has research to offer in the field of arteriosclerotic and senile disorders? Can it produce the concrete results which it has provided in other fields of psychiatry? No, not yet; but it has given us certain glimmerings of hope. It may be recalled that senile and arteriosclerotic psychoses are associated with various forms of cerebral damage which cannot be repaired. Looked at from this angle such psychoses seem hopeless and there is nothing left but to furnish beds for the patients, give them the best care possible, and wait for them to die. This has been the prevailing attitude towards the subject. Interestingly enough, the first ray of light did not come from a study of mental disorders at all, but from observations by Gellerstedt[5] and others on old persons who were normal mentally, a field which may seem far removed from the present problem. Such observations illus-

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trate the principle that research which at first appears to be of no practical value for us as physicians may turn out to be highly important. At the same time, they should teach us that in studying mental diseases of the aged, attention should be devoted to the source of these mental diseases, the normal ageing population.

Gellerstedt demonstrated that some old persons who were normal mentally had just as severe changes in the brain as patients with senile dementia. With this as a starting point, a new conception of senile and arteriosclerotic psychoses was advanced when recent researches[6, 7, 8, 9, 10] on these disorders revealed a frequent lack of correlation between the severity of the mental disturbances and the extent of the cerebral damage. The observations suggested that the cerebral alterations might not be the only etiological factor in senile and arteriosclerotic psychoses but that psychological factors might play a role in their origin. Thus, in certain cases worry, anxiety over failure of health with advancing years, financial hardship, loss of relatives, personality defects, and the like, seemed important. This indicates a new method of approach, since we can do something about such factors. Of course, it is not claimed that worry or unhappiness can be abolished by a simple formula. Nevertheless, psychiatry has worked out methods which can help in solving personal problems and mental conflicts. The point to emphasize is that if these old patients are studied as individuals who break down because of two complementary sets of factors, namely, personal problems in a broad sense and degeneration of the brain tissue, the former will turn out to be of great importance in some cases, which no longer appear entirely hopeless.

The following case may serve as a brief example. G. C., a married man, aged 69, was admitted to Worcester State Hospital on April 6, 1946, with a history of a "rather sudden" onset of mental symptoms three months previously. He had been a good provider, but during the war years he had experienced severe financial reverses, in spite of which he tried to hold on to his property and maintain his standard of living. Finally, however, he lost his house. This was a severe blow to him, and he blamed himself for being unable to look after his wife adequately. He complained of his health and became sleepless and restless. He felt that he had an incurable disease and did not want to see any of his friends. It was stated that "from a rather dynamic business man he has become a cringing, moaning, vegetative being." On admission, the patient was undernourished and feeble. His blood pressure was 150 systolic and 100 diastolic. He was careless of his appearance. His responses were hesitating. He appeared preoccupied, depressed, childish and hypochondriacal. His memory was impaired and he showed a tendency to confabulate to fill in the gaps. During the first two weeks in the hospital he had several periods of partial collapse with a very weak pulse. Thereafter, he improved rapidly with general medical measures and psychotherapy of a simple type. He soon became cheerful and alert, and his memory was good. He was allowed to return home on June 15, 1946, where he has resumed his business activities and has made an excellent adjustment.

Here was a patient who looked as though he was completely through with life and whose intellectual faculties seemed to be failing, but his rapid recovery suggests that some of our elderly patients are by no means hopelessly ill, especially if treated early. It is possible that with a more optimistic attitude and vigorous treatment, both medical and psychiatric, similar results can be obtained in other cases. However, the favorable results in this case should not lead to false hopes. It is an unfortunate fact that in the great majority of instances, the mental illness seems too far advanced, by the time the patient reaches the hospital, for the process to be arrested or reversed.

For example, M. C. K., a woman, aged 76, was recently admitted to Worcester State Hospital in a state of advanced physical and mental decay. She was feeble, helpless, incoherent and confused, with profound impairment of memory. The few remarks that

could be understood referred to her husband. She had been ill for five years, during which period she had show progressive intellectual deterioration. This is a typical case of senile dementia and it is obvious that all one can do is to make her as comfortable as possible and wait for her to die. It is an all too familiar example of the hopelessness of senile (or for that matter arteriosclerotic) disease. But let us glance for a moment at the patient's history. She was well until 1941, when her husband died suddenly under circumstances which were shocking to her. This led to the breaking up of her home and from that time she became confused and forgetful. She was then 71 years of age. But senile cerebral changes do not develop suddenly. They arise very gradually. At 71, the patient already had an old brain, yet she had been able to adjust normally until she was suddenly subjected to serious mental stresses. In the light of the researches mentioned above, it is believed that the mental stresses and not the senile changes in the brain represented the crucial factor which had upset the previously maintained equilibrium. This conception provides hopeful leads for future progress in the field of senile psychoses, for it suggests the possibility that the patient could have been helped if she had been given psychiatric attention when her personal difficulties began, instead of 5 years later when the process had been long irreversible.

These observations indicate that our efforts should be directed toward prevention and early treatment. In our present social set-up, with its loosening of family ties, unsettled living conditions and fast economic pace, there are many hazards for individuals who are growing old.[11] Many of these persons have not had adequate psychological preparation for their inevitable loss of flexibility, restriction of outlets, and loss of friends or relatives; they are individuals who are facing the prospect of retirement from their life-long activities with few mental assets and perhaps meagre material resources. The knowledge that such persons need help is gradually becoming recognized but it is not yet widely enough disseminated.

Another example is in point here. A 75-year old man was recently admitted to the Worcester State Hospital because of memory impairment, mild confusion and marked untidiness of toilet habits of about one year's duration. The striking point in his history was that he had no hobbies and few outside interests, and although he had three presumably intelligent children with whom he lived, they had made no effort to get him interested in any activities after his retirement from work at the age of 69. He would sit for hours at a time just staring into space. It is scarcely surprising that after several years of completely vacuous existence he should regress to an infantile level.

Experiences of this type reveal the need for a broad program of mental hygiene for the older population groups, perhaps analogous to the program of prevention and early treatment provided for younger persons in our mental hygiene and outpatient clinics, but designed to deal with the special problems of ageing. Its establishment would not be a simple task, and it would require long term planning, but in my opinion such a program would amply repay us by diminishing, and perhaps ultimately reversing, the rising trend of admissions for the psychoses of later life.

A related problem has been touched on by Kolb and others,[12] who pointed out that the admission rates for senile and arteriosclerotic patients are much higher in the United States than in other countries. Also, there are differences between urban and rural admission rates, and the question arises whether this is due (as is commonly believed) to the circumstance that it is easier to care for aged psychotics in rural than in urban areas, or whether rural life is actually more favorable than city life for the preservation of mental health in old age. Thus, Kaplan[13] has emphasized the need for a thorough survey of the number of aged psychotics who are not hospitalized. Along with this, one should compare the family relationships and social and economic conditions of psychotic and non-psychotic groups of old persons. Such a study might reveal differ-

ences between the two groups pointing the way to remedial measures.

If anyone thinks that it would be impractical and visionary to devote so much attention to normal old age, it may be recalled that the first real advance in the direction of practical results gained its impetus from research on the brains of old persons who were normal mentally.

One other point of attack on senile and arteriosclerotic psychoses may be mentioned. Even though the great majority of patients seem to be in a hopeless condition by the time they reach the hospital, the question arises whether better methods of handling them can be devised. Old patients present somewhat different problems than younger ones and hospitals which are geared for the more vigorous younger group are in many ways unsuitable for the aged. To remedy this situation one may consider segregation within a suitable part of the state hospital, or the construction of units specially designed for old patients, or attempts to develop resources for their care in the community. From research along such lines it may be possible to work out methods of care which are more successful and at the same time more economical than those now in use. If the patients are segregated into large groups, a better opportunity would be provided for building up a well coordinated plan of research and the investigation of special problems would be facilitated. In such groups, for example, it would be desirable to follow up the lead suggested by Wexberg,[14] that some of the more acute mental disturbances of the aged were caused by nutritional deficiency.

Forward looking groups[15,16] are becoming increasingly aware of the need for intensive and broadly conceived programs of research into the problems of mental health and mental disease in relation to ageing. The Commonwealth of Massachusetts has such a large stake in the matter that it should take an active part in initiating and fostering long-range investigations of the whole subject.

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DISCUSSION

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Dr. Rothschild has emphasized the magnitude of the "Psychoses of the Aged" problem, its economic aspects, and the dire need for research to which he had contributed much before. His paper on the "Origin of Senile Psychosis, Neuropathologic Factors and Factors of a More Personal Nature," given before the first meeting of this society in 1940, where he pointed out that the discrepancies between anatomical changes and mental phenomena in the field of senile conditions could be explained on the basis of differences in the capacity of different individuals to resist or compensate for cerebral damages, and that in certain cases defects of personality are associated with such a high vulnerability that unusually slight changes lead to an unspoken psychosis, was an important contribution. The emphasis on personality factors helped lead me and some of my associates out of the convenient balm for our frustrations as therapists which preoccupation with the neuropathologic damage and internal medical aspects of these problems allowed.

In his first case history the author mentions "he improved rapidly with general medical measures and *psychotherapy of a simple type.*" I shall not attempt to comment on the general medical measures beyond the clinically observed need (1) for more knowledge of the use of drugs as they relate to "old" patients' tolerance for same, especially sedative drugs and (2) nutritional aspects of these cases. The "psychotherapy of a simple type" statement is a most fascinating statement because it occasions comment on points that are clinically observed and are a wide open field for serious research, viz.:

1. That in selected cases a small amount of psychotherapy goes a long way in helping a patient compensate his personality deficits as they manifest in himself and in his interpersonal relationships with people in his community.

2. That psychiatrists working with these patients attain more knowledge in the direction of a better appreciation of the nature of "integrated personal functioning" (Whitehorn) and the self-induced difficulties involved therein. To date individual biographical case studies and especially the scrutiny of the patient's interpersonal attitudes as these become manifest and modified during study and treatment contributed most to this appreciation. At our hospital we are experimenting with the group therapy approach and my associate Dr. Max Weinberger has conducted groups with patients of advanced age. Group setting offers a most excellent opportunity to scrutinize the patient's interpersonal attitudes and observe their manifestations and modification as a result of same. The patients' desires to participate, their struggles to allow themselves to renounce responsibility, their despair and loneliness resulting from isolation from love objects they occasioned, their fear of death—are only a few matters for further clarification and research (especially lessons they may teach in the field of preventive psychiatry) which this approach offers beyond the set of factors of the organic soundness and physiologic condition of the central nervous system, which the fundamental observation of Dr. Rothschild that an amazing amount of destruction of the brain can in some instances be tolerated without serious psychiatric disorders, called to our attention.

3. That the psychotherapy must be planned to meet the patient's needs, not only to regain equilibrium into his personality, but to help reintegrate his personality with those personalities in the community with whom he lives or will live. This takes us into the relatively unexplored field of the role of the social worker and physician team which must coordinate its efforts to place and maintain the patient in the community.

I agree with Dr. Rothschild's recommendation for social studies especially emphasizing the studies of social milieus (rural and otherwise) from the standpoint of what they have to offer in the way of useful and gratifying activities which could preserve in "grandfather" and old "Uncle Joe" a relatively healthier social personality.

Kaufman reported psychoanalytic work

with two patients well advanced in years and came to the conclusion that psychoanalytic technique, with relatively little modification, was applicable, partly as a therapeutic method and definitely as a research instrument, stating that a study of just this type of clinical picture may throw a great deal of light upon the mechanisms of repression, symbolization, displacement and other mechanisms which play an important role in mental functioning. Aiken in discussing Kaufman's paper added, "Ageing seems to be a laboratory, an experiment in nature, in which we have the opportunity to get a clearer and more simple view of psychic structure and function because of the taking place of processes of their decompensation."

Bennett and others[8] have demonstrated the possible usefulness of shock therapies in their patients. Insulin sub-shock may also have something to offer.

I agree with special hospital segregation of old age psychoses in our institutions, as well as provision of specially trained personnel in the allied services for their care. The aged require specialized nursing, medical and feeding facilities, that in our institution as it is equipped are very difficult to fulfill. From the standpoint of institutional planning this has tremendous social implications and need for much research to meet the needs of the aged. That this is a real serious problem to us becomes clear when we observe that out of our 818 first admissions in the year ending June 30, 1945, we admitted 415 patients who were over 60 years of age, or 50.7%.

Dr. Barton and our associates have often asked ourselves questions which require careful research to answer: (1) What further practical measures than those now available can the social group provide to help relatives "hospitalize their aged patients" in their own homes? (2) Can the state hospital's role in the assumption of responsibility for the care of the aged who cannot adjust in a private home be more clearly defined? This would bring into focus the study of other community facilities as well as careful study and probably redefinition of commitment indications.

Indeed the problem must have immediate attention and I compliment Dr. Rothschild again for his well planned program for the future.

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Practical Aspects of Research in Epilepsy

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Research in epilepsy has been carried out along several lines. To determine the practicality of the research it will be helpful to examine it in the light what has been accomplished. Being part of this fast moving world we are apt to be impatient with history, and to justify our almost implicit feeling of progress since antiquity, the ancient concepts and treatments of epilepsy should perhaps not hold us too long, but let me briefly sketch a few of them.

In ancient times those subject to convulsions were believed to be possessed of demons or other spirits, good or evil. It was the local witch doctor of whom relief was sought by way of mysterious incantations. In some cases the skull was sawed or chiseled to allow the evil spirits to escape from the victim of epilepsy. Other theories held that the spirits causing epilepsy were good ones and therefore the condition came to be known as the "sacred disease." One theory held that the disease was contagious and would spread to a well person who had contact with one afflicted. Accounts of seizures which answer the description of epilepsy are to be found in the Bible. For example, in St. Luke 9: 38-39 the father of an undoubtedly epileptic son appeals for help describing the seizure as follows: "All at once a spirit seizes him and he suddenly cries out, and it convulses him till he foams at the mouth and it leaves him after a struggle badly bruised."

As far back as 400 B.C., Hippocrates in Greece argued against the theory of the supernatural causation of epilepsy. He said this so-called sacred disease was attributable to natural causes. Today we do not consider epilepsy caused by spirits—either good or bad. Research through the years has provided some of the reasons for epilepsy.

Treatment during antiquity, was like the causative theories, strange in the light of present day knowledge. Mention is made of a few of these ancient remedies to indicate the more obviously scientific treatment which research through the ages has uncovered and brought to these sufferers. For example, the writings of antiquity include as recommended treatment for epilepsy the following rather ineffective and to say the least gruesome agents, namely—burning a hole in the skull with a red hot iron; drinking the blood of a man freshly slain; and swallowing powdered human skull or urine. Were it not for research we would still be clinging to the superstitions and middle age misconceptions about the disorder.

With this brief resume for background, let us consider some of the more recent aspects of research in epilepsy. Although the central nervous system, and in particular the encephalon or brain, has been known to be the site from which convulsive activity arises, it took years of research to demonstrate what is now taken as an accepted fact. Scientific minds, not convinced that the raison d'etre of epilepsy lay in a vague spirit which could not be actually seen, felt or recognized by tangible signs, began to examine closely the person of those with the strange falling sickness. When death overtook such afflicted people, investigators examined the mortal remains for possible evidence of some tell-tale alteration. In most cases they failed t ofind changes in the organs other than the brain. There was no involvement of the visceral organs such as the heart, the liver, the stomach, the lungs, etc. By contrast, in patients who showed damaged brain tissues the incidence of convulsions was hignificantly high. This led to the appreciation that here at last was the likely site for this terrifying disease.

Succeeding generations of investigators, continuing the painstaking search, lifted higher and higher the dark curtain which hid the true state of affairs. They found

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that brain damage could cause the disease, until today the growing list of possible local causes include damage to the brain resulting from head injuries, tumors, hemorrhage, infections and anomalous development. The practical aspect of this anatomic research is reflected in the studies made to determine in a present day clinical case whether one of these entities is at the bottom of the convulsions. Some of these causes can be removed, others if not removable can be remedied or lessened. Among removable lesions are certain types of tumors such as meningiomas; among remediable conditions are certain infections involving the central nervous system such as meningococcal or syphilitic meningitis. This then is a more practical approach to the conception of the illness than to lay it to vague demons against whom incantations are impotent. But the researchers were not satisfied. They continued to investigate other cases of epilepsy in which paradoxically, they found no demonstrable damage to the brain nor in adjacent structures. However instead of giving up in disappointed despair, these and other investigators carried on their research. To answer their question as to whether the brain could likewise be the site of epilepsy in persons WITHOUT brain damage, an ingenious idea was developed. Electrical stimulation was applied to the body, but no convulsions ensued, until it was applied to certain areas of the brain such as the motor area of this important organ. The latter investigative method demonstrated beyond a doubt that, even in the absence of organic damage, the brain was still the site of convulsive activity. The practical aspect of these findings was, that, faced with a normal looking nervous system in persons with convulsions one could still account for seizures, and unless demonstrably removable pathology were indicated by examination and study, no operative interference was necessary. Electrical stimulation of the various areas of the brain was first carried out in lower animals, then in monkeys, and still later during local anesthesia in humans undergoing cranial operations.

In this way too were determined which areas of the brain controlled movement of the remainder of the body, as of the fingers, arms, feet, face, viscera, etc. This type of research has been performed by Grünbaum, Sherrington, the two Vogts, Foerster, McCulloch, Dusser de Barenne, Penfield and others, and from it the reverse process of determining what portion of the brain is affected can be deduced by studying the bodily manifestations of nervous system involvement. Thus by noting the side of the body involved in the convulsive attack and the character of the spread of the convulsion, one is aided in localizing the affected region of the brain.

More recently an electrical radio type of recording apparatus has been devised as a result of research, to record brain wave function. This apparatus is known as an electroencephalograph, and the fascinating development of electroencephalography is an intriguing story. It was introduced in the field of epilepsy in 1931 by Hans Berger, culminating a long period of research into the electrophysiology of the nervous system, starting in 1883 with von Marxow, when it was first shown that the nervous system of animals possessed electrical properties. One of the fundamental characteristics of the brain is that it possesses, among other activities, electrical activity. This electrical potential, though definite, is of such minute degree that it has required the creation of extremely sensitive apparatus to pick it up and record it. In fact, this electrical impulse of the brain is so small that it is measured not in volts, tenths or even hundreths of a volt but in terms of millionths of a single volt. In order to record them the electroencephalograph magnified these potentials ten million times. Researchers working in the field determined the configuration, height and width of the waves found in the normal individual. Normally these potentials average 10-100 microvolts. The practical aspect of knowing the normal limits is obvious if one is to apply the method to diseased conditions.

As the electroencephalogram measures a function of the brain, one would assume its greatest use would be in conditions altering

its function, but without research to prove it we would have only an assumption rather than our present day knowledge. For it was applied to such conditions, including epilepsy, where its usefulness was not long in doubt. Numerous investigators began carrying out a study in the field, among them being Hans Berger, F. A. and E. L. Gibbs, W. G. Lennox, Golla, Graham, Walter, Jasper, Kershman, Schwab, Finley, Williams and many others including our own at Monson which time prevents listing in full.

A high incidence of brain wave abnormality was found in epilepsy which has since established this test of electroencephalography as an aid in the diagnosis of epilepsy. In fact some pioneer workers were so convinced of the specificity of the EEG findings that they at first suggested re-naming the disease "paroxysmal cerebral dysrhythmia." They were also impressed by the frequency with which certain wave forms seemed to recur in different types of epilepsy. And it is true that these were important initial findings, but research is not content to accept the status quo, and other workers attempting to confirm these findings described limiting factors in this all-out interpretation of the EEG in epilepsy. Nevertheless today certain wave configurations such as the wave and spike or dart and dome forms are practically diagnostic in themselves; and other forms such as waves which are extremely slow or fast, high spikes, and mixtures of these are highly suggestive and call for careful scrutiny for the existence of epilepsy, or some other neuropsychiatric state.

When one remembers how difficult epilepsy may be to diagnose and that often normal findings may prevail after careful physical examination and despite blood, urine, x-ray, spinal fluid and other laboratory examination, the EEG is indeed a welcome and helpful instrument which attests to the practicality of research. In addition the EEG is of distinct value in pointing to the possible presence of a cerebral lesion as for example a tumor, and if such is present the EEG can be extremely valuable in determining the portion of the brain the tumor is occupying as well as its extent, should one be either the cause of the epilepsy or a coincidental finding along with epilepsy. In some cases it indicates the response to treatment.

The problem of hereditary factors in epilepsy has long been an important one, and in the past the main reliance used to analyze its bearing upon the appearance of epilepsy in familial groups has been the statistical study of case histories. With the advent of electroencephalography, the latter was also brought to bear to help resolve this knotty and much disputed problem. The studies of the Lennox group, the Strauss group, Lowenbach, and of our own at Monson State Hospital, indicated the EEG to be of value in detecting the abnormal electroencephalographic factors underlying the hereditary aspect of epilepsy.

During the selection of personnel for the Army, Navy and Air Force, a difficult neuropsychiatric evaluation is the significance of episodic attacks of fainting or convulsions or a history thereof. This is an especially more troublesome problem in military than in civilian practice, because so little of the life history of the candidate is available, and so little time can be spent with the candidate. A research project studying the application of electroencephalography to such cases was carried out by separate groups, namely, Harty and Gibbs, Schwab, Silverman, Solomon, and our own at Monson. The method of electroencephalography was found to be of value in the selection of or rejection of Army, Navy or Air Force personnel whose potential diagnosis involved epilepsy or other unstable neuropsychiatric conditions. This use was introduced as a result of research substantiating the effectiveness of this form of examination.

A similar problem faced us at Monson where research determined that even in epileptics who had ceased having seizures for 5 to 30 years, the EEG showed a high percentage of abnormal tracing, thus making the method of value in doubtful cases. Another of my studies carried out at Monson along a different line was performed to determine whether a single EEG obtained at any time was reliably representative. This

study embraced obtaining an initial EEG and then another a considerable time later. The interval ranged from 5 to 7 years. By revealing that the repeated EEG in most instances was similar to the first, it was demonstrated that a single EEG has a high degree of reliability. The practicality of such research lies in the assurance given to a single testing and in the time saved both the patient and the testing personnel, since repeated testing need not be required routinely.

Research has enabled great strides to be made in the treatment of epilepsy. A variety of medicines dot the therapeutic field in this condition, but it was not until 1857 that the more rational medicinal treatment came into evidence. In that year bromide was introduced and was the main stay until the research of Hauptmann in 1912 introduced phenobarbital, which proved even more effective than bromide in controlling seizures. These two drugs held undisputed sway until 1936 when Putnam and Merritt reported their very valuable research in the use of sodium diphenyl hydantoinate (or dilantin sodium). Numerous extensive and intensive studies have been reported verifying and clarifying the successful use of this anticonvulsant drug. First the drug was tested in animals against artificially produced convulsions, then when so proven it was used for patients by the original investigators in 1938. Other studies confirmed these favorable results as did our own at Monson State Hospital in 1940. Three definite advantages of dilantin sodium were its superior anti-convulsant effect in some cases, its lack of sedation, and its use as an adjunct in combination with phenobarbital. The practicality of such research is indicated by the fact that today such a drug as dilantin, a product of research, is daily dispensed as a routine treatment to many of our epileptic patients of whom over half are much improved as a result of the treatment. This improvement has consisted not only in a marked reduction of epileptic seizures but gain in weight, bettered disposition and greater alertness in contrast to the dulling effect of sedative medications, and an appreciable increase in home visits and discharges from the institution.

One of the most recent additions to the researchers' results is another new anti-convulsant known as 3, 5, 5-trimethyloxazolidin -2, 4- dione, or more simply as tridione. This entirely new compound evolved from a search for a new pain reliever, but the drug was discovered to be an effective barrier against convulsions induced in animals. It was then made available for patients with epilepsy and has been so used with appreciable success for that variety of seizure known as akinetic, petit mal or psychomotor. Everett and Richards first described the drug, and the results in convulsive disorders. Others who have investigated the use of the medicine include Lennox, de Jong, Perlstein and Andelman, and Thorne. At Monson, it has in the type of cases described above, suppressed attacks in 12%, greatly improved 40% of the patients, moderately improved 40%, of the patients on it, and failed in 8%.

I would like to close with a comment regarding research and an anecdote. Research means to search again, and as we are looking for something not yet known, it is not possible to tell you in advance what we shall find. If the answer were known it would not be necessary to undertake that particular search. Nor can one be certain that the answer will be found. The results may point the way to further research or serve to stimulate other workers. It may even be entirely fruitless. But only by trying will the results be uncovered.

Now the anecdote which concerns Michael Farady whose work led to the development of the generator—which among other things charges your auto battery as it builds up the source of power for currents in electrical circuits. Well, when Farady demonstrated that he could change the direction of a compass needle by passing over it a wire carrying a current he was asked what good it was. He replied "what good was a new born baby." And to a member of parliament who asked the same question of Farady the inventive researcher replied, "Some day you will be able to tax it." His

discovery led to the generator if not to the tax.

DISCUSSION

BENJAMIN COHEN, M.D., *Boston:*

Dr. Robinson has ably portrayed the historical aspects of epilepsy and the modern advances in its diagnosis and treatment.

In corroboration of his mention of the improvement which follows modern drug therapy, I wish to draw attention to a study of 79 patients at the Grafton State Hospital in 1941. From 1936 to that year, the total annual number of seizures in this group had been reduced 78.8%. Seventy patients were markedly improved; two were unchanged; and seven refractory patients had a very small increase in attacks. It was found that about 70% of these patients had experienced at least 70% reduction in their attacks, and that the remaining seizures were generally less severe than before. The improvement was also reflected by a striking decrease in lacerations, fractures and other accidents, which had often occurred previously.

Such good results are now being achieved on a wide scale, and in most instances patients can be treated in the community, requiring hospital care only when special studies or treatment are necessary, or when the disorder is unusually severe.

The physician treating the epileptic patient tries to meet individual needs by careful selection of the drug indicated, adjustment of dosage within the limits of the patient's tolerance, and sometimes by the judicious employment of combinations which may be more satisfactory than any one drug alone.

Sometimes it is possible to afford the patient additional protection, when there is a preliminary aura or warning before attacks. Even after the sezures are adequately controlled, the aurae, which are more resistant to treatment, may still occur. By increasing dosage until the aura disappears, the possibility of a seizure becomes more remote.

Since treatment, as Dr. Robinson stated, tends to brighten patients and prevents mental deterioration, they become less dependent, have a better chance of avoiding hospitalization, and become more competent to handle employment.

To publicize the progress being made in the field, to encourage research, and to aid patients in obtaining treatment and employment, the non-profit Layman's League Against Epilepsy was organized, with offices at 50 State Street, Boston.

The problem of employment is particularly important, since although three-fourths of the adult epileptics in the community are regarded as capable of work, they have difficulty in getting and holding jobs because of ignorance about the disease and its curability, and compensation laws which penalize employers for accidents at work.

In remedy, it has been suggested by Dr. Lennox that epileptics should either waive their rights in compensation for injuries resulting from spontaneous seizures, or that the additional costs, if any, should be accepted to permit their employment.

As a precautionary measure, risks could be minimized by advising non-hazardous occupations. It is believed that this can be done effectively by utilizing the aid of existing insurance statistics which reveal the relative safety of jobs.

I believe that progress in the field of epilepsy has kept pace with the generally favorable advances in all phases of medicine. With each new development in therapy, a previously refractory residue of seizures yields in part. The outlook is encouraging and it is hoped that in time it may be possible to give many more patients complete freedom from attacks and the sense of security which comes to those who learn they can live normally without the threat of spontaneous loss or impairment of consciousness.

Grants by United States Public Health Servce

In accordance with recommendations made recently by The National Advisory Mental Health Council, the U. S. Public Health Service announces that three types of grants will soon be available under the National Mental Health Act. These grants will provide funds for training, *for research,* and for community services.

The Service is now authorized to make grants to institutions offering training in psychiatry, clinical psychology, psychiatric social work and psychiatric nursing—for the purpose of improvement, expansion and inauguration of training programs in these fields. Application forms and complete information may be obtained from the Training and Standards Section, Mental Hygiene Division, U. S. Public Health Service, Washington 25, D. C.

The National Advisory Mental Health Council expects to take final action on these applications by the middle of April. Interested schools are urged to make applications immediately.

The National Advisory Mental Health Council has authorized the U. S. Public Health Service to grant a total of not more than 600 stipends this year to graduate students of psychiatry, clinical psychology, psychiatric social work, and psychiatric nursing equally divided among these four fields. The annual stipends range from $1,000 through $2,400 for clinical psychologists, psychiatric social workers, psychiatric nurses and up to $3,600 for psychiatrists, depending upon the level of training for which the applicant is eligible. These awards will be made through the institutions collaborating in this phase of the training program of the U. S. Public Health Service. The names of these institutions will be announced on or about May 1. Interested applicants are requested not to write to training centers or the U. S. Public Health Service about these stipends until the May announcement is made.

Grants for research relevant to the problems of mental health may be made upon the recommendation of the National Advisory Mental Health Council to public and private institutions and to individuals. Application forms are obtainable now from the Research Grants Division, National Institute of Health, U. S. Public Health Service, Bethesda 14, Maryland.

To assist in development of adequate mental health programs at the community level, grants-in-aid will be made to States on a matching basis. These funds are handled by the mental health authority of each State. Professional and lay people interested in specific service projects should bring their ideas to the attention of their State Mental Health Authority.

Funds to inaugurate actual operation of the programs depend on Congressional appropriations. The earliest date such funds may be available is July 1, 1947.

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Positions Open for Research in Psychiatry.—Twelve positions for research in psychiatry and related fields at the Western State Psychiatric Institute and Clinic have been established. The institute is a teaching and research hospital of the Pennsylvania mental hospital system, training psychiatrists, social workers, psychologists, nurses, occupational therapists and others for hospital and private fields. For further information write Dr. Grosvenor B. Pearson, O'Hara and DeSoto streets, Pittsburgh 13.